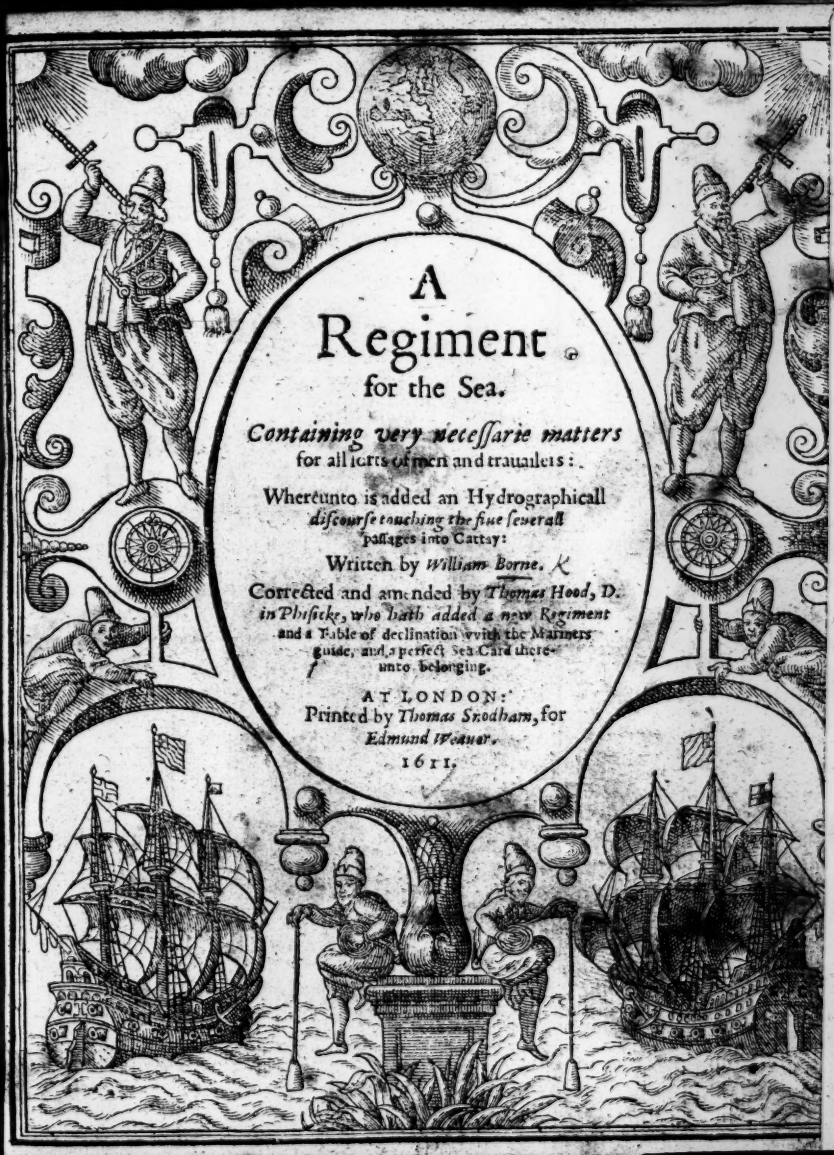


A Regiment for the Sea.

Containing very necessarie matters for all sorts of men and trauailers:

Whereunto is added an Hydrographicall *discourse touching the fiue seuerall* passages into Cattay:

Written by *William Borne.*

Corrected and amended by *Thomas Hood, D. in Phisicke, who hath added a new Regiment* and a Table of declination with the Mariners guide, and a perfect Sea Card thereunto belonging.

AT LONDON:
Printed by *Thomas Snodham*, for *Edmund Weauer.*
1611.



To the Right Honorable George Earle of Cumberland, *Baron Clifford, Lord Bromflet, Atton, Veſcio and* Vypont: Lord of Weſtmerland, and Knight *of the moſt Honorable order of* the Garter.

WHen this booke, Right Honorable, was firſt imprinted, it came forth vnder the Patronage of the Right Honorable *Edward* Earle of *Lincolne*, ſometimes Lord high Admirall of England: That impreſsion being diſperſed it hath beene thought good, that the booke ſhould be corrected and put vnto the Preſſe againe; the labour was aſsigned vnto me: the which I was willing to vndertake, both becauſe it was earneſtly requeſted, and I adiudged it profitable for the Common-wealth: but being ready to come foorth it wanted a Patron, which was not conuenient being ſo honorably protected heretofore, and deſeruing now as well, as it hath alwaies done. Wherefore deuiſing with my ſelfe vpon this occaſion to commend it to the Honorable Tuition of ſome worthy man, I was moued to dedicate it to your Honor: firſt, by the generall conſent of many who wiſh you well, and iudge you a fit Patron for ſuch a worke: ſecondly, by the honorable fauor, which (as occaſion hath beene offered) I haue alwaies found at your Honours hands: thirdly, by the inclination of your minde to Marine cauſes. If therefore, Right Honorable, the conſent of many, mine owne thankefull minde, whereof this is a ſigne, or your Honors inclination to theſe ſtudies, may either ſeuerally one by one, or ioyntly altogether moue you to the Tuition of this worke, it ſhall be ſufficiently defended (as I hope) from enuious tongues, and I by your fauour ſhall be inuited continually to imploy my pen to the commodity of my country, and to make my prayer for your Honors daily increaſe in all good things.

Your Honors moſt humblie
affectionate *T. Hood.*

5 1 ½
10 2 1
20 4 2
40 8 4
10 2 1
3 12 4

To The Reader.

Gentle Reader, I haue thought it good now in this Impression to mend or correct, certaine faults that were in the first, but most specially in the second Impression: For that it was printed the second time I not knowing thereof, so that it had not onely those faults that were printed out of the first written copie, but now a number of new faults more then that it had in the first: wherefore I haue not onely mended and corrected those faults, but in like manner I haue added other necessary matters. not before this time printed as this; What Eccentricitie is, and also what Paralax is, and his vse, as it doth appeare in the fift folio of the booke. And also I haue in like manner shewed how that Sea-men shall know when that the Mone is in her flow, and swift motion, which is knowne by the Prime, as it is declared in the third Chapter. And also how for to know the Mones latitude, as it is shewed in the fourth Chapter. And also I doe shew in the fift Chapter, the cause that there is more daies from the Equinoctiall of March vnto the Equinoctiall of September, then there is from the Equinoctiall of September, vnto the Equinoctiall of March. And also I haue added vnto the tenth Chapter, certaine matters as touching discoueries vnto the North parts. And furthermore, I haue shewed in the foureteenth chapter, how for to

know

know how fast or softly that any ship doth goe, and how for to kéepe a perfect account of the ships way. And also I haue altered cleane the seuentéenth Chapter, and shewed how that the sea-men shall know what part or quantitie they haue passed or gone of the whole earth, whereby they should know the diuersitie of aspects, as the Eclipses of the Moone, and the alteration of time, and also I haue added diuers things in sundry places of the Booke, that I doe omit for brenitie. And in like manner I haue added vnto the end of the booke a Hydrographicall discourse for to goe vnto Cattay fiue seuerall or sundrie wayes, that is to say, the first way is about by Cape bone sperance, which is that way that the Portugals goe vnto Calicut, and vnto the Moluccas, and other places in the East Indies: The second way is through the straights of Magelane, into the South sea. The third way is towards the Northwest, whereas Captaine Forbisher, and Christopher Hall, hath begunne the discouerie now called Meta Incognita. And the fourth way is by the Northeast by the coast of Noua Zembla, that Maister Stephen of Borose hath begunne that discouerie. And the fift way is by the North Pole, if that it be Nauigable, &c.

Now it is possible that I may bée enuied of diuers and sundry people, for that I haue written this discourse of the passages vnto Cattay, for that the nature of a number of men is to dislike of all things not done by themselues: But notwithstanding all is one vnto me, whether they do like or dislike. For that I doe know some persons haue already made euill report of that I haue written before this time, yet notwithstanding I will not stay my pen for their malice: for although their skill is much more then mine, my meaning is not to teach any of them, but to instruct the simplest sort of sea-men, and to shew vnto them such things as are necessarie for them for to know. And also some sort of people are of that nature, if that they write or talke of any things past their capacitie, then they will say that hée can talke well, but they themselues cannot talke, but they can

doe; but this is the truth, whatsoeuer he be that will say that he can doe any thing, and if that he cannot shew the reason of the doing thereof, I doe say vnto you hee cannot doe it, and this is most certaine, for if that he doth it, he doth it but by fortune, euen as hee that drew his bow by chance in the Assyrians hoast, and slew Achab the King of Israel, as we doe reade in the third booke of the Kings, and the last Chapter, when that Iosaphat the King of Iuda and Achab King of Israel, went to battaile against Ramoth in Gilead.

For this is generall amongst Sea men and also Gunners, how simple or without skill soeuer they be, if that they haue once taken charge to be the Master of a Ship, he thinketh great scorne to learne at any mans hand, but will bragge of himselfe how long he hath beene a Master, and God knoweth vtterly without skill, but that he is a Coaster, and doth know the markes for to carry a Ship ouer the Lands ende, and ouer the Nuase.

But good simple men, if that they could not doe that, then there were nothing in them: For euery man must needes be skilfull and know that place, that a number of times he hath occupied, and hath beene taught vnto him.

And who doubteth but a simple Fisherman of Barking, knoweth Barking Creeke, better then the best Nauigator or Master in this land? so who doubteth, but these simple men doe know their owne places at home? But if they should come out of the Ocean Sea to seeke our Channell, to come vnto the Riuer of Thames, I am of that opinion, that a number of them doth but grope as a blind man doth, and if that they doe hit well, that it is but by chaunce, and not by any cunning that is in them.

But I doe hope that in these dayes, the knowledge of the Masters of Ships is very well mended, for I haue knowne within these 20 yeeres, that they that were auncient Masters of Ships haue derided and mocked them that haue occupied their Cardes and Plattes, and also the obseruation of the Altitude of the Pole, saying: that they care

not

not for their shæpes skinnes: for he could kæpe a better account vpon a bwrd.

And when that they did take the Latitude, they would call them Starre-shooters, and Sunne-shooters, and would aske if they had striken it. Wherefore now iudge of their skils, considering that these two points are the principall matters in Nauigation. And yet these simple people will make no small bragges of themselues, saying, that he hath bæne Master this twentie yæres and neuer had no misfortune, and also if that they could heare of any that did vse Plats and instruments that had any misfortune, then they would not a little brag of themselues, what notable fellowes they themselues were.

O what a notable follie was in these men, not considering what they themselues were. For this is most certaine, that it is not wisedome nor cunning, that can preuent or alter Gods prouidence if that it please him to lay his scourge vpon vs. For if that men through cunning could preuide that no misfortune should happen vnto them, then were they Gods and not men, and yet notwithstanding we must not condemne cunning and knowledge: but put all things vnto fortune, then you may take one from the plough, and make him master of a ship, and say he hath good fortune. And thus (gentle Reader) I cease, requesting thée to accept this as a simple present, procéding of good will.

Thine, *W. B.*

THE REGIMENT
FOR THE SEA.

FOR that the common people do fall into such a number of errours as touching the length of the day, holding an opinion, that in every fifténe daies, the day is an houre longer or shorter, the truth is this: the day doth kéepe no such proportion in the lengthning and shortning, but doth lengthen and shorten according vnto the swiftnesse and slownesse of the Sunnes declination: for when the Sunne hath swift declination, then doth the day lengthen and shorten apace: and when that the declination is slow, then doth the day lengthen or shorten but slowlie. And yet the most part of the common people doe hold an opinion, that at Christmasse or else at New yeeres day at the furthest, the day must néeds be an houre longer, and yet the Sunne hath not declined or come towards the Equinoctiall two degrées and a halfe, which will not make halfe an houre in the length of the day: wherefore I doe thinke it good to declare through the whole yeere, when the day is an houre longer or shorter here in this place, for the latitude or height of the Pole Articke at London, the Pole being raised fiftie one degrées, thirtie two minutes, or thirtie foure minutes: and our longest Summer day is fifténe houres and a halfe, and our shortest Winter day seauen

houres

houres and a halfe, from the rising of the Sunne vnto the setting of the Sunne: and first this the shortest Winter day, is the eleventh or twelfe day of December, and the Sun riseth a quarter of an houre after eight, and setteth a quarter of an houre before foure of the clocke, and the Sunne hath his greatest declination vnto the South wards. The twentie nine day of December, the day is a quarter of an houre longer, and the sunne riseth at eight of the clocke, and setteth at foure. The seuentéenth or eightéenth of Januarie, the day is an houre longer and not before, for the sunne must be declined from his Solstice of winter fiue degrées and twelue minutes, before the day is lengthened an houre; so that I doe affirme, that from the fourth or fift day of November, vnto the seuentéenth or eightéenth day of Januarie, in all that time the day is but one houre shorter or longer, which is the time of ten wéekes. The twentie seauen or twentie eight of Januarie, the night is fiftéene houres long, then riseth the Sunne halfe an houre after seauen, and setteth halfe an houre after foure of the clocke. The seauenth or twelfth day of Februarie the day is ten houres long, then riseth the Sunne at seauen, and setteth at fiue of the clocke. The fire and twentie day of Februarie the day is a leauen houres long, then riseth the Sunne halfe an houre after fire, and setteth halfe an houre after fiue of the clocke. The leauenth day of March, then the Sunne is in the Equinoctiall, and the day iust twelue houres long all the world ouer. The foure & twentith day of March, the day is thirteenth houres long, and then riseth the Sunne halfe an houre before fire, and setteth halfe an houre after fire of the clock. The seuenth day of Aprill the day is fourteene houres long, and then riseth the Sunne at fiue of the clock iust, and setteth at seauen of the clock iust. The 23. day of Aprill the day is fiftéene houres long, and then riseth the Sunne halfe an houre before fiue, and setteth halfe an houre after seauen of the clocke. The fiftéenth day of May the day is sixtéene hours long then riseth the Sunne at foure of the clocke, and setteth at eight of

the

the clocke iuſt. The eleuenth of June the Sunne hath his greateſt declination to the Northward, and then is our lengeſt ſummer dayes conſiſting of ſirteene houres and a halfe, from the ſonne riſing vnto ſunne ſetting, ſo that the ſunne riſeth a quarter of an houre before foure, and ſetteth a quarter of an houre after eight of the clocke. The tenth day of July the day is ſirteene houres long, then riſeth the ſunne at foure, and ſetteth at eight of the clock. The laſt day of Julie, the day is fifteene houres long. The ſirteenth day of Auguſt the day is foureteene houres long. The laſt day of Auguſt the day is thirteene houres long. The thirteenth or foureteenth of September the ſunne is in the Equinoctiall, and the day is iuſt twelue houres long. The twentie ſeauenth day of September the day is eleauen houres long. The eleuenth day of October the day is ten houres long. The twentie firſt day of October the day is nine houres long. The fifteenth day of Nouember the day is eight houres long: and ſo vnto the eleuenth or twelfe day of December, at which time the day is at the ſhorteſt, as before is declared.

Thus much haue I ſaid as touching the length of the day by euen houres, which ſome people will haue at the entrance of the Sunne into the twelue ſignes, but it is not ſo; yet this you may obſerue, that when the Sunne hath declined fiue Degrées and twelue Minutes in this our Latitude, then is the day one houre longer or ſhorter. You ſhall finde this matter more largely ſpoken of, concerning the length of the day in all places through the world, in the eleuenth Chapter of the Booke.

A Table of the reignes of the Kings since the Conquest.

Number of Kings and Queenes	The Names of the Kings of England	Beginning of their Reigne	Time of their death.	The place of their buriall.
1	William Conquerour	14. Oct.	9 Sept. 1087.	Caen in Norm.
2	William Rufus.	9 Sept.	1 Aug. 1100.	Westminster.
3	Henry the first	1 Aug.	2 Dece. 1136.	Redding.
4	Stephen	2 Dece.	25 Oct. 1154.	Feuersham.
5	Henry the second	25 Oct.	6 July 1189.	Fonteuerard.
6	Richard the first.	6 July.	6 April 1199.	Fonteuerard.
7	John.	6 April	19 Oct. 1216.	Worcester.
8	Henry the third	19 Oct.	16 Nou. 1272.	Westminster.
9	Edward the first.	16. No.	6 July 1307.	Westminster.
10	Edward the second	6 July.	25 Jan. 1327.	Gloster.
11	Edward the third	25 Jan.	21 Jun. 1377.	Westminster.
12	Richard the second	21 June	16 Sep. 1400.	Westminster.
13	Henrie the fourth	16 Sep.	20 Mar. 1413	Canterburie.
14	Henry the fift	20 May.	31 Aug. 1422.	Westminst.
15	Henry the first	31 Aug.	4. Mar. 1461.	Winsor.
16	Edward the fourth	4 Marc.	9 April 1483.	Winsor.
17	Edward the fift	9 April	22 June 1484	Westminster.
18	Richard the third	22 June	22 Aug. 1486.	Leycester.
19	Henry the seuenth.	22 Aug.	22 April 159.	Westminster.
20	Henrie the eight	22. April	28 Jan. 1547.	Winsor.
21	Edward the first	28 Jan.	6 July 1553.	Westminster.
22	Quéene Marie	6 July	17 No. 1559.	Westminster.
23	Quéene Elizabeth	17 No.	24 Mar. 1602.	Westminster.
24	James.	24 Mar.		

Ianuarie hath xxxi. daies.

3	1	a	New yeéres day.
	2	b	Octa. Stepha.
11	3	c	Octa. Iohn
	4	d	Octa. Inno.
19	5	e	Theolopho bi.
8	6	f	Twelfe day.
	7	g	Iulian martyr
16	8	a	Seuerine bishop
5	9	b	Martian virgin
	10	c	Paule first her.
13	11	d	Sunne in Aquar.
2	12	e	Satire martyr
	13	f	Oct. Epipha.
10	14	g	Isidore martyr
	15	a	Maurice
18	16	b	Anthony Abbot
7	17	c	Marcelle bishop
	18	d	Prisce bishop
15	19	e	Mari. and his fel.
4	20	f	Fabian and Sa.
	21	g	Agnus virgin
12	22	a	Vincent martyr
1	23	b	Emerice.
	24	c	Thimothy disci.
9	25	d	Con. of Paule
	26	e	Policarp martyr
17	27	f	Chrisost. Doct.
6	28	g	Theodore.
	29	a	Valerie bishop
14	30	b	Tran. S. Marke
3	31	c	Cir. and Ian.

Februarie hath xxviii. daies, in the yeer of Bissextilis and xxix. daies.

	1	d	Brigit. Fast.
11	2	e	Puri. of Mary.
19	3	f	Blase martyr
8	4	g	Gilbert Confess.
	5	a	Agathe virgin.
16	6	b	Dorithe virgin
5	7	c	Amandus bishop
	8	d	Salomon
13	9	e	Sunne in Pisces.
2	10	f	Sother bishop
	11	g	
10	12	a	Euphrase virgin
	13	b	Valantine bishop
18	14	c	Faustine bishop
7	15	d	Iulian virgin
	16	e	Constance virgin
15	17	f	Simeon martyr
4	18	g	Gabine Priest
	19	a	
12	20	b	60. Martyrs
1	21	c	70. Martyrs
	22	d	Peters Chaire
9	23	e	Sirener Fast
	24	f	Mathie Apostle
17	25	g	Polycar bishop
6	26	a	Victor and his fel.
	27	b	Augustine bishop
14	28	c	Oswald bishop.

March hath xxxi. daies.

3	1	d	Dauid bishop.
	2	e	Basilic martyr.
11	3	f	Marine martyr
	4	g	Lucius martyr
19	5	a	Focius martyr
8	6	b	Vict. and benin.
	7	c	Tho. de Aquin.
16	8	d	Apoline martyr
5	9	e	40. Martyrs
	10	f	Gregorie bishop
13	11	g	Sunne in Aries.
2	12	a	Zacharie bishop
	13	b	Longine mar.
10	14	c	Patricius bishop
	15	d	Gertrude virgin
18	16	e	Anselme
7	17	f	Edward King
	18	g	Joseph sponſ.
15	19	a	Cutbert bishop
4	20	b	Benedict Abbot
	21	c	Affrodose bishop
12	22	d	Pigment bishop
1	23	e	Theodore
	24	f	Fast.
9	25	g	Annun. of Mary
	26	a	Castore martyr
17	27	b	John Heremy
6	28	c	Dorothe martyr.
	29	d	Eustace.
14	30	e	Sabine virgin.
3	31	f	Balbine virgin

Aprill hath xxx. daies

	1	g	Theodore virgin
11	2	a	Mary Egyptian
19	3	b	Richard bishop
8	4	c	Ambrose bishop
	5	d	Marci. and Ma.
16	6	e	Dertus martyr
5	7	f	Euphemi. virgin
	8	g	Denise martyr.
13	9	a	Perpetuus bishop
2	10	b	Marcus martyr
	11	c	Sunne in Taurus
10	12	d	Appoline martyr
	13	e	Sother martyr
18	14	f	Tiburt martyr
7	15	g	Olmond bishop
	16	a	Isidore bishop
15	17	b	Anicete bishop
4	18	c	Eluther bishop
	19	d	Tiburtius Conf.
12	20	e	Hermogenes.
1	21	f	Quintine.
	22	g	Clete bishop
9	23	a	George martyr
	24	b	Mildride Conf.
17	25	c	Marke Euangel.
6	26	d	Anastace bishop
	27	e	Vitalis martyr
14	28	f	Peter of Pi.
3	29	g	Clete bishop
	30	a	Dep of Esken.

May hath xxxi. daies.

11	1	b	Philip and Iacob.
	2	c	Athanasius bish.
19	3	d	Inu of the crosse.
8	4	e	Christopher.
	5	F	S. Augustine.
16	6	g	John Portlat.
5	7	a	John of Beuer.
	8	b	Appe. of Pich.
13	9	c	Transl. of Ni.
2	10	d	Gordaine.
	11	e	Sunne in Gemini
10	12	F	Victorius martyr
	13	g	Seruatius Conf.
18	14	a	Boniface martyr
7	15	b	Sophia Virgin.
	16	c	Brandon bishop
15	17	d	Transl. of Bar.
4	18	e	Dioscor martyr.
	19	F	
12	20	g	Dunstance Conf.
1	21	a	Barnardine.
	22	b	Helene Quene.
9	23	c	Petronil.
	24	d	Julian virgin.
17	25	e	Desidere martyr.
6	26	F	Adelme Conf.
	27	g	
14	28	a	Germaine bishop
3	29	b	Nicodeme.
	30	c	Cosme martyr.
11	31	d	Fehr bishop.

Iune hath xxx. daies.

19	1	e	Nicodeme
8	2	F	Erasmus
	3	g	Basill
16	4	a	Parcel martyr
5	5	b	Petrocius Conf.
	6	c	Boniface bishop
13	7	d	Pedrad and Gil.
2	8	e	Transl. Edmond
	9	F	Puan Conf.
10	10	g	Transl. of Wol.
	11	a	Barnabe Apostle.
18	12	b	Sunne in cancer.
7	13	c	Anthony Confes.
	14	d	Basilides Conf.
15	15	e	Vate modeste
4	16	F	Transl. Richard
	17	g	Botulph Conf.
12	18	a	Eruperie Bishop
1	19	b	Gerualius martyr
	20	c	Transl. Edward
9	21	d	Walburge virgin
	22	e	Albane martyr
17	23	F	Fast
6	24	g	John Baptist.
	25	a	Transl of Elig.
14	26	b	John and Pa.
3	27	c	Crescens martyr
	28	d	Fast
11	29	e	Peter and Paul.
	30	F	

			Iuly hath xxxi. daies.
19	1	g	Octa. John Bap.
8	2	a	Visit. of Mary
	3	b	Gregory bishop
16	4	c	Domitius martyr
5	5	d	Parthene Conf.
	6	e	Procope martyr
13	7	f	Zenone martyr
2	8	g	Paterian bishop
	9	a	Pius bishop
10	10	b	Dog daies begin
	11	c	Hermaco. for.
18	12	d	Anaclete bishop
7	13	e	Quirine and Ju.
	14	f	Sunne in Leo.
15	15	g	Marine virgin.
4	16	a	Simph. cum 7.
	17	b	Ariene hem.
12	18	c	Prarede virgin
1	19	d	Margar. virgin
	20	e	Prarede virgin
9	21	f	Appoline bishop
	22	g	Mary Magdalen
17	23	a	Christian
6	24	b	Fast.
	25	c	James Apostle
14	26	d	Anne mo. of Mary
3	27	e	Panthaleon.
	28	f	Sampson bishop
11	29	g	Mary virgin
	30	a	Abbo. and fel.
19	31	b	German bishop

			Auguſt hath xxxi daies.
8	1	c	Lammas.
16	2	d	Stephen bishop.
	3	e	Finding of Ste.
5	4	f	Iuſtine Priest
	5	g	Feſtum nivis
13	6	a	Tranſ. Domini.
2	7	b	Feast of Jeſu
	8	c	Ciracke & his fel.
10	9	d	Roman martyr
	10	e	Laurence martyr
18	11	f	Tibort and Su.
7	12	g	Clare virgin
	13	a	Ypolite virgin
15	14	b	Sunne in Virgo.
4	15	c	Aſſump. of Mary
	16	d	Rothe Confeſſ.
12	17	e	Octa. Laurence
1	18	f	Agapite martyr
	19	g	Lewes bishop
9	20	a	Dog daies end
	21	b	Anaſtaſe martyr
17	22	c	Timo and Yip.
6	23	d	Eleazor. Faſt
	24	e	Barthol. Apoſtle
14	25	f	Lewes King.
3	26	g	Zepherine bishop
	27	a	Rufus martyr
11	28	b	Auguſtine bishop
	29	c	John beheaded
19	30	d	Felix and Iuda.
	31	e	Cuthber virgin.

September hath xxx. daies.				October hath xxxi. daies.			
8	1	f	Giles Abbot.	16	1	a	Remigius bishop
		g	Anthony martyr	5	2	b	Leodegar martir
16	2	a	Eupheme	13	3	c	Candide martyr
5	3	b	Moses Pro.	2	4	d	Frances mar.
	4	c	Venturine		5	e	Faith Virgin.
13	5	d	Zacharie Prop.	10	6	f	Gerionis
2	6	e	Encrce bishop.		7	g	Marce and mar.
	7	f	Nativity of Ma.	18	8	a	Apolinaris mar.
10	8	g	Gorgonie martyr	7	9	b	Pelagi Virgin.
	9	a	Nicolas de To.		10	c	Linus Confess.
18	10	b	Protece and Hi.	15	11	d	Denice & his fel.
7	11	c	Sire bishop	4	12	e	Nichasius bishop
	12	d	Philip bishop		13	f	Wilfride bishop
15	13	e	Sunne in Libra.	12	14	g	Sunne in Scorpio
4	14	f	Nicodeme priest	1	15	a	Calixt bishop
	15	g	Edith Virgin		16	b	Wolfran bishop
12	16	a	Lambart bishop	9	17	c	Vich. of the moût
1	17	b	Victor and Cor.		18	d	Luke Euangelist.
	18	c	Eustace	17	19	e	Etheldred virgin
9	19	d	Fast	6	20	f	Friswide virgin
	20	e	Matthew Apostle		21	g	Austrebet virgin
17	21	f	Maurice	14	22	a	vi. M. Virgins
6	22	g	Line martyr	3	23	b	Mary Salome
	23	a	German Abbot		24	c	Romane bishop.
14	24	b	Cleophin and Ap.	11	25	d	Magnore bishop
3	25	c	Cipian and Jul.		26	e	Chrisp. and Chrit
	26	d	Cosme and Da.	19	27	f	Fast
11	27	e	Erupere bishop	8	28	g	Simon and Iude.
19	28	f	Michael. Arch.		29	a	Marcellus bishop
	29	g	Hierome Doct.	16	30	b	Germaine Conf.
8	30			5	31		Fast.

Nouem-

			November hath xxx. daies.				December hath xxxi. daies.
	1	d	All Saints.		1	F	Elegi bishop
13	2	e	All Soules	13	2	g	Liban martyr
2	3	F	Winefride virg.	2	3	a	Dep. of Osmond
	4	g	Amantius		4	b	Barbara virgin
10	5	a	Lete Priest	10	5	c	Sabba bishop
	6	b	Leonard		6	d	Nicolas bishop
18	7	c	Wilborde	18	7	e	Oct. Andrew.
7	8	d	Foure crowned	7	8	F	Con. of Mary
	9	e	Theodore		9	g	Cyprian bishop
15	10	F	Maxime	15	10	a	Eulalie virgin
4	11	g	Martine bishop	4	11	b	Antippe
	12	a	Brise bishop		12	c	Damase Conf.
12	13	b	Sunne in Sagit.	12	13	d	Sun in Capricor.
1	14	c	Tran. Erkenew	1	14	e	Nicasius virgin
	15	d	Macute bishop		15	F	Othalie virgin
9	16	e	Dep. of Edmond	9	16	g	O Sapientia
	17	F	Init. Reg. Elizab.		17	a	Lazarus Conf.
17	18	g	Oct. Martine	17	18	b	Gatian bishop
6	19	a	Elizabeth mar.	6	19	c	Venetia virgin
	20	b	Edmond King		20	d	Fast
14	21	c	Pref. of Mary	14	21	e	Thomas Apostle
3	22	d	Cicely virgin	3	22	F	Fry. Martyrs
	23	e	Clement mar.		23	g	Victor virgin
11	24	F	Grisogon mar.	11	24	a	Fast
19	25	g	Catherine virg.		25	b	Christmas day
	26	a	Line martyr	19	26	c	Stephen martyr
8	27	b	Vitalis Conf.	8	27	d	Iohn Euangelist
	28	c	Rufus mar.		28	e	Innocents day.
16	29	d	Saturni. Fast.	16	29	F	
5	30	e	Andrew Apostle	5	30	g	Tran. of James
				13	31	a	Silvester martyr.

A Table or Kalender for 24. yeeres,

shewing the Prime, the Sundayes letter, and Leape yeere, and the moueable Feasts, as the first Sunday in Lent, and Easter day, Ascention day, and Whitsunday.

The yeere of our Lord.	The Prime.	Dominicall Letter.	First Sunday in Lent.	Easter day.	Ascention day.	Whitsunday.
1595	1	dc	28. Febru.	11. April	20. May.	30. May.
1597	2	b	13. Febru.	27. Mar.	4. May.	15. May.
1598	3	a	5. March.	16 April	25. May.	4. June.
1599	4	g	25. Febru.	8. April.	17. May.	27. May.
1600	5	fe	9. Febru.	23 Mar	1. May.	11. May.
1601	6	d	1. March.	12. April	21. May.	31. May.
1602	7	c	21. Febru.	4. April.	13. May.	23. May.
1603	8	b	13. March.	24. April	2. June	12. June.
1604	9	ag	26. Febru.	8. April	17. May	27. May.
1605	10	f	17. Febru.	31. Mar.	9 May.	19. May.
1606	11	e	9. March.	20 April	29. May.	8. June.
1607	12	d	22. Febru.	5. April	14. May.	24. May.
1608	13	cb	14. Febru.	27. Mar.	5. May.	15. May.
1609	14	a	5. March.	16. April	25. May.	4. June.
1610	15	g	25. Febru.	8. April.	17 May.	27. May.
1611	16	f	10 Febru.	24. Mar.	2 May.	12. May.
1612	17	ed	1. March.	12. April	21. May.	31. May.
1613	18	c	21. Febru.	4. April.	13. May.	23. May.
1614	19	b	6. March.	17. April	26. May.	5. June.
1615	1	a	26. Febru.	9. April.	17. May.	27. May.
1616	2	gf	18. Febru.	31. Mar	9. May.	19. May.
1617	3	e	9 March.	20. April	29. May.	8. June.
1618	4	d	22. Febru.	5. April.	14. May.	24. May.
1619	5	c	14. Febru.	28. Mar	6 May.	16. May.

A profitable

A profitable and necessarie rule to know the beginning and ending of euery Terme, with their Returnes.

Hillarie Terme beginneth the xviii. of Ianuarie, if it be not Sunday, which then is referred vntill the next day after, and endeth the xii. of Februarie, and hath foure Returnes, that is to say:

Octauis Hillarii	Crastino Purific.
Quind. Hillarii	Octauis Purific.

Easter Terme beginneth xbii. dayes after Easter, and endeth the Sunday next after the Ascention day, and hath fiue Returnes, that is to say:

Quind. Pasch.	Mens.	Quinque Paschæ.
Tres. Pasch.	Paschæ:	Crast. Ascention:

Trinitie Terme beginneth the friday next after Trinitie Sunday, and endeth the Wednesday fortnight after, and hath foure Returnes, that is to say:

Crast. Trinitatis.	Quind. Trinitatis.
Octauis Trinit.	Tres Trinitatis.

Michaelmas Terme beginneth the ix. day of October, if it be not Sunday, and endeth the xxviii. or xxix. of November, and hath eight Returnes, that is to say:

Octauis Michael.	Crast. Animarum.
Quind. Michael.	Crast. Martini.
Tres Michaelis.	Octa. Martini.
Mense Michael.	Quind. Martini.

Note also that the Exchequer openeth eight daies before any Terme begin, except Trinitie Terme, which openeth but foure dayes before.

Thirtie daies hath September, Aprill, Iune, and November
February hath xxviii. alone: and all the rest thirtie and one.

AN INTRODVCTION vnto the Regiment for the Sea.

The names of certaine things, necessary to be knowne of them that are Marriners, or Sea-faring men, meete to be knowne of them that doe practise Nauigation, as this: the names of the circles of the Sphære, and what they are, and their vses: and also the names of other things belonging thereunto, and what they are, and their vses.



First, what the Horizon is.

THe Horizon is a great circle of the globe, diuiding the part of the world séene, from the part vnséene, and this Horizon is changed when you do moue: for as you go by trauaile change your place, so doth the Horizon alter continually.

The vse of the Horizon circle.

THE vse of the Horizon is this, the height of the Sun or any starre is counted from it vpward, the which height is taken with the crosse staffe, setting the one end with the Horizon, and the other end with the Sun or Star, so that you haue a true Horizon: The which true Horizon is to be found onely at the Sea, or else vpon a very plaine ground vpon the top of a hil. Moreouer if the Sun or Mone, or any Star be to be séene, then they be aboue the Horizon: if they be not to be séene, then they be vnder the Horizon.

2. What the Meridian is.

THE Meridian is a great circle beginning due South, and so passing by your Zenith, that is right ouer the crowne of your head, and so by the two Poles of the world: and if you doe trauaile due South and North, you doe not

change

change your Meridian: but in the going or trauailing any other way, you doe change it.

The vse of the Meridian circle.

THe vse of the Meridian Circle is, to know the iust time of noone by the Sun: for as soone as the middle of the sun is in the Meridian, then it is, noone; and when the Sunne Moone, or any Star is in the Meridian, then they be farthest from the Horizon, and it is a meete time to take their height, for to know the Altitude or height of the Pole of the world, whereby you may perfectly know, how farre you be to the Southwards, or Northwards of any place.

3. What the Equinoctiall circle is.

THe Equinoctiall is a great circle in the heauens, equally distant from both the Poles, and doth passe directly ouer the middle of the earth round about, and is called the Equinoctiall, for that if the sunne be there, then thorow all the whole world the sunne is twelue houres aboue the Horizon, and twelue houres vnder the Horizon, saue vnder the two Poles, where the Equinoctiall is confident with the Horizon. So they shall see halfe the sunne and no more, till the Sun be departed from the Equinoctiall, and also to them that do inhabite or dwell in any place vnder the Equinoctiall, the Sun, Moone, and all the Starres, be twelue houres aboue the Horizon, and twelue houres vnder the Horizon.

The vse of the Equinoctiall circle.

THe vse of the Equinoctiall, is to know what declination the sunne or any other starre hath from it, and on which side, by the which declination the height of the Equinoctiall is knowne, and by the height of the Equinoctial, is known the height of either of the two poles of the world.

4. What the circle or Tropicke of Cancer is, being a parallel circle.

THe Tropick of Cancer, is a lesser circle of the Spheare, limiting the greatest declination that the Sunne doth

come vnto Northwards, and then is our longest summer day and shortest night.

5. What the circle or Tropicke of Capricorne is, being a parallel circle.

THe Tropicke of Capricorne, is a lesser circle limiting the greatest declination that the sun hath Southwards, and then is our shortest winter day, and longest night.

The vses of these two circles be but small, but that the sunne comming vnto them, the daies be at the longest or shortest, and the Sunne doth then returne backe againe, &c.

6. What the Arcticke circle is, being a parallel circle.

THe Arcticke circle is a lesser circle of the Spheare touching the Horizon due North, increasing and diminishing according to the altitude or height of the Pole: for as you doe go vnto the South parts, then doth your Arcticke circle grow narrower and narrower, vntill you come right vnder the Equinoctiall line, and then haue you no Arcticke circle: and if that you do goe vnto the North parts, then doth your Arcticke circle grow wider & wider: where the North Pole is raised 66. degrées and a halfe, there the Arcticke circle and the Tropicke of Cancer are both one, and vnder the North Pole, your Arcticke circle and the Equinoctiall are both one.

90-00
66-30
23-30

The vse of the Arcticke circle.

THe vse of the Arcticke circle, is to know what starres doe neuer set vnto you, for all those starres or lights that you do see betweene it & the Pole, do not set: and if that the North Pole be raised more then 66. degrées and a halfe, the Sun or Moone being in the Tropicke of Cancer shall not go downe vnder the Horizon, but shall be still in sight vnto you, so that they be not let by the cloudes and other accidents.

7. What the Antarcticke circle is, being a Parallel circle.

THe Antarcticke Circle doth touch the Horizon due South, and is opposite or right against the Arcticke Circle,

Circle, and doth widen and narrow in all points as the Arcticke circle doth, not differing from it saving that the Arcticke circle is above the Horizon, and the Antarcticke circle is underneath the Horizon.

The vse of the Antarcticke circle.

THE vse of the Antarcticke circle is to know what Starres will not appeare above your Horizon, so that to the Northwards of 66. degrées and a halfe, the Sun or Mone being in the Tropicke of Capricorne will not rise above the Horizon.

8. What the Zodiacke is, being a circle.

THE Zodiacke is a great circle in the heauens, vnder the which all the wandring lights or Planets doe kép their courses, that is to say, the Sunne and Mone, and the other fiue Planets or Starrs, Saturne, Iupiter, Mars, Venus, and Mercurie. This circle is diuided into twelue equal parts called the xii. Signes, which are these, Aries, Taurus, Gemini, Cancer, Leo, Virgo, Libra, Scorpio, Sagittarius, Capricornus, Aquarius, Pisces, the said circle standeth oblique or awrie, crossing the Equinoctiall in the middle at two places: and is 12. degrées broad, that is to say, fiue degrées from the middell Northward, and fiue degrées vnto the Southward.

The vse of the Zodiacke.

The vse of the Zodiacke is, to know in what signe the Sunne and Mone, and the other Planets are, and also to know the time of the change of the Mone, with all the other aspects: and in like manner to know the aspects of the other Planets vnto the Mone, also the Planets amongst themselues: and by the aspects in the xii. signes is gathered their effects, and in what Countrie they may happen.

9. What the line Eclipticke is.

The line Eclipticke is a Circle in the very middle of the

Zodiacke, vnder the which the very middle or center of the Sunne doth continually moue.

The vſe of the line Eclipticke.

The vſe of the line Eclipticke is this, if that the Moone or any other Starre, be vnto the North part thereof, then it is ſaid, that they haue North Latitude, and if vnto the South part, then they haue South Latitude: and alſo by this Circle called the line Eclipticke, is knowne the Eclipſe of the Sunne and the Moone.

10. What the Arcticke polar circle is, being a parallel circle.

The Arcticke polar Circle, is made by the pole of the Zodiacke, or pole of the circle Eclipticke 23. degrées and a halfe diſtant from the poles of the world.

11. What the Antarcticke Polar circle is, being a parallel circle.

The Antarcticke Polar circle, is iuſt oppoſite vnto the Arcticke Polar, made by the Antarcticke pole.

12. What the two circles called Colures be, &c.

The two Circles called Colures, be thoſe that doe diuide the Zodiacke, and all the other parallel circles, into foure equall parts, the one of the circles doth croſſe the Zodiacke in the firſt point of Aries and Libra, and ſo paſſeth by the poles of the world, and is called the equinoctiall colure: and the other Colure circle doth croſſe the Zodiacke in the firſt point of Cancer and Capricorne, and ſo paſſeth the two Poles of the world, and at the two Poles the one circle doth croſſe the other: e that is called the Solſtitiall Colure.

The vſe of theſe two circles.

The vſe of the two Colure circles is this, the ſun paſſing by them, doth diuide the yéare into foure parts in this manner, the Sun in the firſt point of Aries is ſpring time, &c.

13 What

13. What the two Poles of the world are.

The two Poles of the world, (that is to say, the North Pole, called the Pole Arcticke, and the South Pole, called the Pole Antarcticke) are two points in the heauens, whereof the one is directly against the other, at the ends of the Axletrée of the world: the North Pole is alwaies abone our Horizon, and the South Pole Antarcticke alwaies vnder our Horizon, and the Equinoctiall iust and equally betwéene them: from these two Poles there must be vnderstood a right line to be drawen, which is called the Axletrée of the world, about the which the whole Heauens, and all the lights of the Firmament be carried round from the East vnto the West in xxiiii. houres: so that no light nor place in the heauen remaineth vnremoued, but only the two Poles of the world and the said Axletrée.

The vse of the Poles of the world.

The vse of the two Poles is this, to know how far we do transport our selues, and to know what Climate and temperateneſſe we be in, as touching heate and cold.

14. What the two Poles of the Zodiacke are.

The two Poles of the Zodiacke or Eclipticke, imagined to be at the end of the Axletrée of the Zodiacke or Ecliptick, are the Arcticke pole of the Zodiacke, or rather the Ecliptick, and the Antarcticke pole of the Zodiacke, the one being directly against the other, and the Zodiacke or the Ecliptick, to be iust or equall betwéene them.

15. What the Zenith or verticall point is.

The Zenith or verticall point, is imagined to be a pricke in the heauens right ouer the crowne of your head, and is moueable as we our selues be, and is the Pole of the Horizon circle: and as you do transport your selfe from one place vnto another, so doth your Zenith or verticall point, and your Horizon circle also change.

The

The vse of the Zenith or verticall point, &c.

The vse of the Zenith or verticall point is this, to know how nére or how far off any ſtar is from your Zenith, by taking the true height of any ſtar with an Inſtrument, for that from your Zenith is alwaies 90. degrées downe vnto the Horizon on euery ſide round about you, as it ſhall more plainly appeare hereafter, where I ſpeake of degrées.

16. What a degree is.

A degrée, is the part or diuiſion of a whole circle, diuided into 360. equall parts, how big or ſmall ſoeuer the circle be.

The vſe of the degrees is manifold.

The vſe of the degrées, is to know by the Sunne and Moones courſe in the Zodiacke, or any other of the Planets or moueable Starres, how many degrées they be aſunder: whereby is knowne at what time they haue any aſpect the one with the other: and alſo by the degrées it is knowne what latitude and what declination any light or Star hath from the Eclipticke or Equinoctiall: and alſo the degrées will ſhew vnto you how many miles that you doe tranſport your ſelfe vpon the earth to the South or North parts, for that euery degrée doth anſwere vnto 60. Engliſh miles, in the going South and North: which is knowne by the altitude of the North Pole, or the number of degrées betwéene the Equinoctiall and your Zenith or verticall point, for from your Zenith vnto the Horizon, is 90. degrées to the Southwards, and 90. degrées vnto the Northwards, which is halfe the compaſſe of the heauens, for twiſe 90. is 180. and then the earth doth hide the other halfe of the heauens: and twiſe 180. maketh 360. the whole content of the compaſſe of euery great Circle in the heauens.

17. What a minute is.

Of Minutes there be two ſorts, minutes of time, and minutes

minutes of measure, and is no other thing but the 60. part of a degrée, or the 60. part of an houre: and all the divisions in these matters are by 60. For as 60. minutes is a degrée, or an houre, so 60. seconds is a minute, and 60. thirds is a second, and 60. fourths is a third, &c.

18. Altitude or height, and the vse thereof.

Altitude or height of any thing taken (as the height of the Sunne or any Starre, or the height of the Pole aboue the Horizon: or the height of a steeple, or tower, or such other like,) is the length of the right line contained betweene the center of the Sunne or Starre, or betweene the toppe of any thing whose height we desire to know and the Horizon, limited and expressed by the degrées or parts of that instrument whereby we take the said height.

19. Latitude, is wideneſſe: the vſe thereof.

Latitude is in the heauens: if the Moone or any other Starre be vnto the South parts, or the North parts of the the Ecliptick, that then it is said, to be so many degrées in latitude or wideneſſe, from the line Ecliptick to the South or North part: and also Latitude is counted vpon the earth in like manner, if that you be in any place betweene the Equinoctiall and any of the two Poles, and it is expressed by the degrées of the Meridian contained betweene the Equinoctiall and the Zenith, or verticall point of the place wherein you are, either to the South or North part &c.

20. Longitude, is length: the vse thereof.

Longitude in the heauens is the portion of the Ecliptick, contained betweene the head of Aries, and that great circle which is drawne from the Poles of the Ecliptick through the center of the Sunne or any other Starre whatsoeuer, down vnto the Ecliptick, the which Longitude is expressed either by the number of degrées contained in the said portion of the Ecliptick, or else by the signes and the particular

degrées

degrées of that signe, vpon which the forefaid great circle drawne from the Poles of the Ecliptick doth light. As for example, if the portion of the Ecliptick contained betwéene the head of Aries and that great circle which is drawn from the Poles of the Ecliptick through the center of any Starre, vnto the Ecliptick, do comprehend 100.200. or 300. &c. degrées, then is the Longitude of that Starre said to be so much, or otherwise if the said great circle light vpon any Signe, as vpon Taurus, or Gemini, then is the Starre said to haue his Longitude in Taurus, &c. And also Longitude vpon the earth is counted from the Canarie Ilands vnto the Eastward, and it is that portion of the Equinoctiall which is contained betweene the Meridian of the Canarie Ilands, and the Meridian of the place assigned. This Longitude is denominated and expressed by the degrées of the Equinoctiall contained betweene the two foresaid Meridians, so that if betwéene the said Meridians there be contained 20.30.40 &c. degrées, then is the assigned place said to be so much in Longitude, whereby is known the time of the changes of the Moone, or any other aspect, or any Eclipse of the Sunne or Moone at the Citie or towne.

21. Declination is leaning: the vse thereof.

Declination is counted in the heauens, if that the Sunne or any other Starre be vnto the North part or South part of the Equinoctiall and it is designed or expressed by the degrées of the great circle, drawen from the Poles of the world through the center of the Sunne or Starre, contained betwéene the Equinoctiall and the center of the Sunne or Starre propounded, whereby it is said that the Sunne or Starre hath so many degrées of declination to the South, or to the North parts as it happeneth, &c.

22. A Circumference is the line which encloseth a circle by the outer edge.

23. Diameter is the breath of a circle, passing right ouer the center or middle thereof, from outside vnto outside.

24. Center

24. Center is the middle pricke in any circle, equally distant from the edge of the circle in euery place.

25 Parallel lines or circles are, two lines or more, (how many soeuer there be) equally distant in euery place alike.

26. Auge, what it is.

Auge is a point in the heauens, when the Sun or Mone is eccentricke, going nérer vnto the Heauens, and further from the earth, then her common order is: and the oppositi-on thereof is, when that the Sonne and Mone doe, come nérer vnto the earth, then they doe at any other time.

The vse thereof.

The vse thereof is, to know when that they be in their swift motion, or in their slow motion: for the Sunne and Mone being in the Auge, moueth slower then in the oppo-site of the Auge.

27. Eccentricitie, what it is.

Eccentricitie is the distance betwéne the center of the eccentricke circle of any Planet, and the center of the world.

28. What the head or taile of the Dragon is.

The head of the Dragon, is the place where that the Mone or any other Planet doth come ouer the line Eclip-ticke from the South part vnto the North part: and the taile of the Dragon is, where the Mone or any other Planet passeth ouer the line Eclipticke, from the North part, vnto the South part.

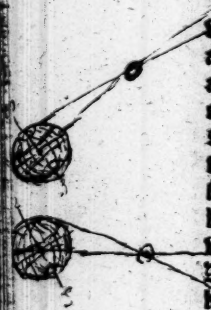
The vse of the head and taile of the Dragon.

The vse of the head and the taile of the Dragon, is to know when that there is any Eclipse of the Sunne or Mone: and of what quantitie or greatnes the Eclipse is.

29. Paralax, what it is.

Paralax is the portion of the heauen contained betwéne two

Addition. two right lines, whereof the one is drawen from the center of the world, the other from the surface of the earth, through the center of the Moone or some other Planet, vnto the Primum mobile.



The vse thereof.

The vse of the Paralax is manifold, for that it sheweth where and in what countries that the Sunne is eclipsed, as in some places the Sunne may be all wholy Eclipsed, and in some place halfe Eclipsed, and in some parts of the earth nothing Eclipsed at all, and yet the Sunne and the Moone both aboue the Horizon, which reason is before shewed. And also the vse of the Paralax is, if that you doe see any extraordinarie light in the heauens, as Comets or blazing starres, by their Paralax their distance is knowne what they are from the earth, and by their distance their Diameter being taken, then the magnitude of the body is knowne, therefore there be great things to be knowne by the obseruation of the Paralax.

30. What Nauigation is.

Nauigation is an Art teaching how to direct our course in the Sea, to any place assigned, and by what direction, what things may stand with him, and what things may stand against him, hauing consideration how to preserue the Ship in all stormes and changes of weather that may happen by the way, to bring the Ship safe vnto the port assigned, and in the shortest time.

The vse of Nauigation.

The vse thereof is this, first to know how that the place doth beare from him, by what winde or point of the compasse, and also how farre that the place is from him, and also to consider the streame, or tide gates and Currents, which way that they do set or driue the Ship, and also to consider what dangers are by the way, as Rocks & Sands, and such other

other like impediments, and also if that the winde change or shift by the way, to consider which way to stand, and direct his course vnto the most aduantage, to attaine vnto the port in shortest time: and also if any stormes doe happen by the way, to consider how for to preserue the Ship and the goods, and to bring her safe vnto the port assigned: and also it is most principally to be considered and foresæne, that if they haue had occasion by a contrary tempest, for to goe very much out of the course or way, to know how the place doth then beare, that is to say, by what point of the compasse the place doth stand from you: and also how farre it may be from you. Which way to be knowne, is this: First, to consider by what point that the Ship hath made her way by, and how fast or slowly that the Ship hath gone, and to consider how often that the Ship hath altered her course, and how much that she hath gone at euery time, and then to consider all this in your Plat or Card, and so you may giue a nære gesse, by what point or winde it beareth from you, and also how farre it is thither. And also you may haue a great help by the Sun or Starrs, to take the height of the Pole abone the Horizon, and also in some place you may gesse by the sounding, both by the depth and also by the ground: and also it is very mæte and necessarie to know any place, when that he doth sée it.

31. Of Instruments to vse at the Sea, for to take the height of the Sunne, or any Starres.

The originall of the making of all Instruments to take the height of the Sunne or any Starre, is either a circle, or the part of a circle, whose diuision is into 360. parts, what forme soeuer that it hath, as your crosse staffe it is marked accoording vnto the proportion of a circle: and euery one of the degrées is the equall part of a circle, namely, the three hundred and sixtie part, &c.

The

The vſe of the Inſtruments.

The vſe of the Inſtruments, as Aſtrolobes, or common rings, or the croſſe ſtaffe is to take the height of the Sun or other Starres, whoſe vſes doe follow hereafter in the booke.

32. What manner of perſons be meeteſt to take charge of Ships in Nauigation.

As touching thoſe perſons that are méete to take charge, that is to ſay, to be as a Maſter of ſhips in Nauigation, hée ought to be ſober and wiſe, and not to be light or raſh headed, nor to be too ſumiſh or haſtie, but ſuch a one as can well gouerne himſelfe, or elſe it is not poſſible for him to gouerne his company well: he ought not to be too ſimple, but he muſt be ſuch a one as muſt kéepe his company in awe of him (by diſcretion, doing his company no iniury or wrong, but to let them haue that which men ought to haue, and then to ſée vnto them, that they doe their labour as men ought to do, in all points. And the principall point in gouernment is, to cauſe himſelfe both to be feared and loued, and that groweth principally by this meanes, to cheriſh men in welldoing, and thoſe men that be honeſtly adicted, to let them haue reaſonable préeminence, ſo that it be not hurtfull vnto the Marchant, nor to himſelfe, & to puniſh thoſe that be malefactors and diſturbers of their company, and for ſmall faults to giue them gentle admonition to amend them: and principally theſe two points are to be forſéene by the Maſters, (that is) to ſerue God himſelfe, and to ſée that all the whole company do ſo in like manner at ſuch conuenient time as it is méet to be done: the ſecond point is, that the Maſter vſe no play at the dice or cards: neither (as néere as he can) to ſuffer any, for the ſufferance thereof may do very much hurt in diuers reſpects: and furthermore, the maiſter ought to be ſuch a one, as doth know the Mones courſe, whereby he doth know at what time it is a full ſea, or a low water, knowing in what quarter or part of the ſkie, that the Mone doth make

a

a full sea at that place, and also the Maister ought to be acquainted or know that place well, that he doth take charge to goe vnto (except that he have a Pilot.) And also he that taketh charge vpon him, ought to be expert how the tydegates or currents, doe set from place vnto place: and allonot to be ignorant of such dangers as lye by the way, as rocks, sands, or bancks, and also most principally, he ought to be such a one as can very wel direct his courses vnto any place assigned, and to have capacity how for to handle or shift himselfe in foule weather or stormes. And also it behoueth him to be a good coaster, that is to say, to know every place by the sight thereof. And also he that taketh charge for long voyages, ought to have knowledge in Plats or Cards, and also in such instruments as be méete to take the height of the Sun, or any Star, and to have capacitie to correct those instruments, and also he ought to be such a one, that can calculate the Sunnes declination, or else to have some true regiment, and also he ought to know how to handle the Suns declination, when that he hath taken the height of the Sun.

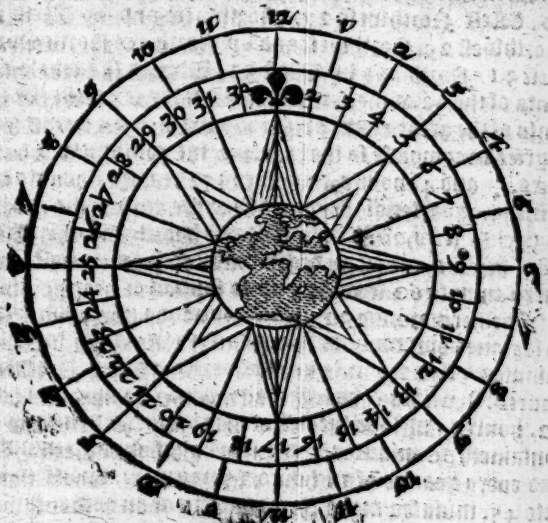
Now beginneth the Regiment for the Sea, the first Chapter of Navigation, and sheweth what the 32. points of the compasse is, and to what vse they doe serue.

THe first and most principall thing for any seafaring man, or trauailer, is to know toward what part of the earth he meaneth to goe, and then being vpon the sea, where he seeth no path nor marke to trauaile by, he ought to be expert in the vse of the Needle or Compasse. Wherein this is to be noted: there be eight Capitall or head winds or points, whereof foure of them are called Cardinals, and haue their 8. Capitall or head points.

names properly of themselues, and the other foure of them are deriued or take their names of the other foure, as this: South and North are in the opposite points of the intersection of the Horizon and Meridian, and East is in the intersection of the Equinoctiall and the Horizon, towards the Sun rising, and West is right against it. North east is in the midway betwéene the East and the North, and South east in the midway betwéene the East and the South, and Southwest betwéene the West and the South, and Northwest is in the middle betwéene the North and the West. Moreouer, there be 8. inferior points or windes, halfe way betwéene euery one of those eight capitall or head points or windes, and those haue the names of the two points that he standeth betwéene, as that point that standeth betwéene the North and the Northeast, is called North Northeast, and that point betwéene the East and the Northeast, is called East Northeast, and also that point that is betwéene the East and the Southeast, is called East Southeast. And so forth vnto the rest of the eight points, whose names doe follow, as South Southeast, and South Southwest, and West Southwest, and West Northwest, and North Northwest: and now betwéene euery one of these inferior points, and euery one of the head winds, there is a by-point, or wind, and hée is called a by-point, for that hée is not named but by the name of one of the head points next adioyning. There be 16. of them in number, so that there be eight capitall or head points, and eight inferior points, and 16. by-points or windes, so that in all there be 32. of them. The vse of these points is, to direct the Ship to what quarter of the world you doe assigne, to kéepe that course, to finde the place so assigned, for that the propertie of the Néedle or Flie, is alwaies to stand due South and North.

8. Inferior points, or winds.

As



As touching Nauigation, for the instructions of the meanest, I haue set this figure or Compasse: where first is to be noted the 32. winders and points of the Compasse abone made. The Flourdelice is the first point, and these be the names beginning at the North, and so with the course of the Sunne, according vnto the common order that Sea-men do teach or instruct their youth, which is this. North 1. North and by East 2. North Northeast 3. Northeast and by North 4. Northeast 5. Northeast and by East 6. East Northeast 7. East and by North 8. East 9. East and by South 10. East Southeast 11. Southeast and by East 12. Southeast 13. Southeast and by South 14. South Southeast 15. South & by East 16. South 17. South and by West 18. South Southwest 19. Southwest & by South 20. Southwest 21. Southwest & by west 22. West Southwest

The names of the 32. points of the compasse

23. West and by South 24. West 25. West and by North 26. West Northwest 27. Northwest and by West 28. Northwest 29. Northwest and by North 30. North Northwest 31. North and by West 32. This is the whole contents of the 32. winds, and there is in the compasse the contents of the great circle, or Equinoctiall circle, being 360. degrées in compasse, so that euery point containeth 11. degrées, $\frac{1}{4}$ and 4. points containee 45. degrées, 8 points containe one quarter of the compasse or Equinoctiall circle, being 90. degrées, 16. points containe halfe the circumference 180. degrées, and euery degrée containeth 60. minuts, and euery minute 60. seconds, and so forth.

The contents of the Equinoctiall circle 360. degrees, one point of the Compasse containeth 11. degrees and a quarter.

Furthermore, the 32. points containe 24. houres, that is to say, one point containeth 3. quarters of an houre, or 45. minutes. And 2. points one houre and a halfe, 4. points 3. houres, 8. points 6. houres, 12. points 9. houres, 16 points 12. houres, and so to the rest of the points. And euery houre containeth 60. minutes, and euery halfe houre 30. minutes, and euery quarter of an houre 15. minutes, and after that rate 45. minutes make three quarters of an houre.

The 32. points brought into 24. houres,

To Find the quart how the golden Numb

for this yeare of our lord 1736. the golden number is. 8. multiplyed by 11. is 88. which d by 30. 11 / 30)88(2 / 60 gives 2. and remaine 28 The 28 Quart

The second Chapter treateth of the Golden number *or Prime, shewing the Epact, and by the Epact,* to know the age of the Moone.

IT is necessarie and conuenient for the sea-faring men, to know the Prime or golden number: for by the golden number is knowne the Epact and the Epact sheweth the age of the Moone or change day, within 12. houres vnder or ouer: and by the age of the Moone, you may know at what a clock it doth flow, in any place that you do know what Moone doth make a full sea: therefore it is meet to know the Epact, and that is knowne by the Prime, or golden number. The cause why it was called the golden number, was because it was sent out of Egypt in letters of gold, to the Romanes.

The cause why that it is called the Prime, was for that it was the first order that the Moones course was known by, and it is thus knowne. Adde one to the yéere of our Lord whereof you would know the golden number or Prime, then diuide the number by 19. the remainder is the Prime: and multiply that by 11. and looke what the number commeth vnto, diuide that by 30. the remainder is the Epact. Then when you haue once the Epact, adde 11. to your Epact for euery yéere more, and looke what that commeth to, that is your Epact: and if it do passe 30. put that away, and kéepe the remainder for your Epact. And thus this rule will serue for euer, sauing when the Prime beginneth at one, for then the Epact is 11. and then do (as afore, said) as you may perceiue by this Table here following.

The cause why that is called the Prime, or golden number

To know how many the Epact is.

The Table of Prime and Epact for xix. yeeres, *and when those xix. yeeres be ended, then* begin againe, and so it will serue for euer &c.

The yeere of the Lord	Prime	Epact	The yeere of the Lord	Prime	Epact
1599	4	14	1609	14	4
1600	5	25	1610	15	15
1601	6	6	1611	16	26
1602	7	17	1612	17	7
1603	8	28	1613	18	18
1604	9	9	1614	19	29
1605	10	20	1615	2	11
1606	11	1	1616	2	22
1607	12	12	1617	3	3
1608	13	23			

The Prime is the time of xix. yeeres.

The Prime or golden number, is the time of 19. yéeres, in the which time the Moone maketh all her changes or coniunctions with the Sunne, and when these nineteene yéeres be expired, then she begimneth againe: as for example. In the yéere of our Lord 1599. she changed the 26. day of March, and euery yéere doth alter 11. daies of her change, till the yéere 1618. and then shée chaungeth the said twentie fixe day of March againe, as I shewed you before: the Epact is the putting to 11. for euery yéere. Now furthermore to know the age of the Moone, doe thus, take the number of the Epact for your yéere (beginning at March alwaies) and recken how many moneths it is from March counting March forone) then recken how many daies of the month it is, in which you would know the age of the Moone: then put

put all your number together, (that is to say, your Epact, your moneth from March, and every day is the moneth) then looke how many it amounteth vnto, that in the age of the moone, if the number added doth not exceed 30 but if it passe 30. throw all the 30. away, the remainder sheweth the age of the moone, for when the age of the moone is iust 30. then is it the change day. This is to be vnderstood concerning those months which haue 31. daies, for in them that haue only 30 daies, the coniunction is at the 29. day. and they which passe 29. are the age of the moone: Item vnto Februarie, we must giue 29. daies, though ordinarily that moneth hath but 28. daies, if it be the fifteenth day of the age of the moone, then the moone is at the full. When the age is betweene seuen daies and eight, then is the first quarter. And if it be 22. daies old, then the moone is at the last quarter: The rule is manifest in this example: the yeere 1599 I take & finde the Epact 14. I would know the age of the moone the 18. day of June. I recken how many moneths it is from March, reckening March for one, & I finde it is 4. moneths: then I take and adde all these together, that is to say 14. for the Epact, and foure for the moneths (that is to say, March, April, May, Iune,) and then 18. for the day of the moneth, and all commeth to 36. So that you may conclude, that the moone is 7. daies old, and changed 7. daies before.

To know the age of the moone, by the number of the Epact.

The third Chapter treateth how to know by the age of *the Moone, what houre it doth flow, or is full sea at* any place where you do know what Moone maketh a full Sea.

NOw by the age of the Moone you may know at what houre it is a full Sea, in any place where you do know what moone maketh a full Sea, which rule commonly the sea-men call, the shifting their Sun and moone, & many waies there be to doe it, for thus they may doe it: let them

diuide one houre into fiue parts, and then take foure of those parts, and put the first part away, that resteth for the alteration of the Moones course in 24. houres, and the foure fift parts of an houre are 48. minutes, and the fift part of an houre is 12. minutes. A flood and an ebbe doth alter 24. minutes forwards: as thus for example, it floweth 12. of the clock at the lands end, vpon the change day, the Moone being in the South, at all times a full sea. The Moone being one day old, it floweth 12. of the clocke, 48. minutes: two dayes olde, it floweth one of the clocke, 36. minutes: three day olde, it floweth 2. of the clocke, 12. minutes: 4. dayes old, it floweth 3. of the clocke, 24. minutes: fiue dayes old, it floweth 4. of the clocke iust. 6. dayes olde, it floweth 4. of the clocke, 48. minutes: seauen daies olde, fiue of the clocke, 36. minutes: eight dayes old 6. of the clocke, 24. minutes: 9. dayes old, seauen of the clocke, 12. minutes: ten daies old, it floweth 8. of the clocke iust: 11. dayes old, 8. of the clocke, 48. minutes. 12 dayes old 9. of the clocke, 36. minutes: 13. daies of old, 10. of the clock, 24. minutes: 14. daies old, it floweth 11. of the clocke, 14. minutes. 15. daies old, it floweth 12. of the clocke iust: then begin the full Moone, and so begin againe as you did before at one day olde, and so forth. For to finde the course of the tides is nothing else but to adde for euery day of the age of the Moone 48. minutes: and by this account you may at all times know at what a clocke it doth flow, by putting to euery flood and ebbe 24. minutes, and to 2. floods, & 2. ebbes putting to 48. minutes.

To know the alteration of the Tides in 24. houres. An ensample for the full sea vpon the lands end for euery day of the age of the moone.

To shift the sunne and the moone by the points of the Compasse.

Now furthermore, the sea-men vse to make their account by this meanes (but it is all one) they doe allow for euerie day of the age of the Moone, one point and three minutes: for a point of the compasse containeth 45. minutes, that is 3. quarters of an houre. Then they put three minutes to 45. minutes, which make 48. minutes, the said 3. minutes is the 15. part of a point, & from the change to the full is 15. daies, so that (the halfe compasse being 16. points) they breake the odde point into 15. parts, & that commeth to 3. minutes,

so

so that the alteration of tides, for euery 24. houres be 48. minutes, or 4. fifth parts of an houre. Wherefore there shall follow a table of tides, about certaine places of this realme: for euery Moone contayneth 29. dayes, 12. houres 44. minutes from change to change: the whole contents of the houres of the Moone, be 708. houres, and 44. minutes. And there are in euery yére 12. changes of the Moone: and the yére containeth 365. daies, 5. houres, 55. minutes, 26 seconds. Yet some doe affirme to be odde fiue houres, but there lacketh 4 minutes, 47. seconds in the Tropicall yére. Likewise in the yére be 12. moneths agréable to the 12. Moones: the 12. moones containe but 354. daies, so that there be xi. dayes more in the yére, then there be in the 12. moones. The yére also is diuided into 12. moneths, which moneths haue taken their names at the will and pleasure of men: as first Januarie was so called of Ianus, who had two faces: for the month of Januarie beholdeth the end of the yére past, and the beginning of the yére to come. Februarie tooke his name of certaine Romane sacrifices, called Februa. March is so called of Mars, for Romulus so named it, after the name of his father. Aprill comes of Aperio, because that then the earth is opened. May, of Maia, the mother of Mercury. June so called by preparing the young men to the warre. July, of Iulius Cæsar: and August of Augustus Cæsar, for in that moneth hé entred the Consulship: then the rest of the moneths toke their names of their number from March. Now in these 12. moneths, which make the yére, the Sunne doth passe or goe through the Zodiacke called the 12. Signes, which is the occasion of the yére: for this is to be noted, that the Sunne, as I said before, doth go by his naturall moning in 365. dayes, 5. houres, 55. minutes, 26. seconds, through the Zodiacke, containing 360. degrées, his course being from the West into the East, against the course of Primum mobile, or first mouer, being mooued by the mightie prouidence of God, which maketh the 24. houres: and so doth all the 7. lights

The contents of the number of daies and houres in one moone, the houres in euery moone be 708. 44. minutes.

The content of a yeere is 365. daies, 5. houres 55. minutes.

How the moneths tooke their names.

120
3
360

The Zodiacke containeth 360. degrees.

The mooning of 24. houres.

lights or Planets, except that it be in their retrogradation: but the Sunne and Moone be neuer retrograde, as the other fiue Planets or lights be. And this is to be noted, that the Moone goeth faster then the Sun, for she goeth through the whole Zodiacke in twenty seuen daies and eight houres. Now in that same time the Sunne is remoued by his naturall mouing from that place of the Zodiacke where twentie seauen degrées: and then because that the Moone hath not found the Sunne there, it is two daies, foure houres, and foure and forty minutes more before that the Moone ouertaketh the Sunne againe, so by that meanes, it is 29. daies, twelue houres, and foure and fortie minutes betweene the change of the Moone, and the next change, throw the yére. although that the Moone may change sometime in lesse time, & sometime in longer time, that is by the meanes of the three motions of the Moone, that is to say, her swift motion, and her meane motion, and her slow motion, which groweth by the meanes of the Moones Auge, or opposition thereof. The Moone being in Auge goeth but little more then twelue degrées in 24. houres. And in the opposition of Auge where 15. degrées in 24. houres, and in her maine or equall motion 13. Degrées, 12. minutes. So this is the occasion why sometime the Moone may chaunge sooner, or be detracted longer then the time of 29. daies, 12. houres, and 44. minutes. This point of Auge is moueable, & doth passe throw the Zodiacke in the time of 19. yéres: and it causeth sometime the full of the Moone to happen sooner and later. In like manner also the quarters of the Moone with all the other aspects, that the Moone hath with the Sunne, or any other of the Planets, according to the Moones motion: In like manner (by the meanes of the three motions of the Moone, sometime the Moone goeth more then one point and 3 minutes in 24. houres, and sometime lesse then one point and 3. minutes, as for example: the Moone being in her slow motion goeth but little more then 12. degrées in 24. houres, yea, and sometime lesse, and then the Sunne in that

The time that the moone goeth thorow the 12. signes.

The three motions of the moone.

Of Auge.

The cause why the moone changeth rather or later.

The moone goeth in 24. houres sometime more degrees, and sometime fewer degrees.

that time doth goe one degrée: and then is there but 11. degrées betweene the Sunne and the Moone, (that is but 44. minutes. So that the Moone is not one point in 24. houres from the Sunne. But being in her swift motion she goeth néere 15. degrées in 24. houres, and the Sunne goeth one degrée in that time: so that there is 14. degrées in 24. houres betweene the Moone and the Sunne, (that is 56. minutes) which is a point, and 11. minutes. Wherefore I do thinke it very necessary for to shew somewhat of the Moones motion, that they may know when that the Moone is either in her swift motion or her slow motion, for that I doe know that there is not in respect, any sea-men that doth know it, because commonly they have not Sea-men that have any sight or knowledge in the moones Theorickes: therefore let them note these few words following.

The moone is not one point asunder from the Sunne in 24 houres. Additions.

Séeke out in the Ephemerides the name of the moneth wherein you would know the swiftnesse or slownesse of the moones course. In the vttermost columne answering to that moneth towards the right hand, you shall finde the words Apog: and Perige: whereof the first signifieth the Auge of the moone, the other signifieth the opposition of the Auge.

The day of the moneth which standeth against the word Apog: is it wherein the moone is slowest; the other against which the word Perige doth stand, is it wherein the moone is swiftest. The which thing you may easily prooue true in this maner. Right against the word Apog: séek out the place of the moone toward your left hand vnder the Character of the moone, subduct that out of the next number following (by putting thirtie degrées vnto that which followeth if néede so require,) and note the remainder. In like manner against the word Perige: séeke out the place of the moone, and subduct it out of the next number following, compare this remainder with the former, and you shall alwayes find it to be the greater, whereby you may conclude the moone then to be in her swiftest motion. The like may be wrought

by

by any common Almanacke by ſubducting the degrés which the Moone poſſeſſeth the firſt day of the moneth out of the degrés which ſhé poſſeſſeth the ſecond, and ſo conſequently going on from the ſecond to the third, foureténe times together, vntill you find the greateſt or the leaſt remainder. Where you finde the greateſt remainder in that ſigne, and on that day the Moone is in her ſwifteſt motion, and in the oppoſition of her Auge, and 14. daies after ſhé will be in her ſlowéſt motion, in her Auge: but where you finde the leaſt remainder there the Moone is ſlowéſt, and 14. daies after ſhé will be in her ſwifteſt motion: This rule is vnfallible, and therefore is to be followed rather then that which being grounded vpon the Prime, is moſt vncertaine. It is moſt neceſſarie for ſea-men to know this ſwiftneſſe or ſlowneſſe of the moone in diuers reſpects, for if that the moone be in her ſwift motion, then it cauſeth the change, quarter, or full of the moone to be the rather. But contrariwiſe, when that the moone commeth from her ſlow motion, then that doth detract the time the longer before the moone doth change, or is at the full or any other aſpect.

And thus much I haue ſaid of the Moones motion: for that ſome ſea-men will take vpon them to correct the Almanackes as touching the change and quarters of the moone: holding this opinion, that euery moone ought to be equall in the number of the daies and houres: and the full moone to be iuſt the halfe contents. And the quarters in like manner, the iuſt fourth part in daies and houres, ſo that ſome of them will take vpon them to tell (by the rule of the Epact,) the true houre of the change, quarters, and full of the moone. Wherein they are notably deceiued.

Errour of Mariners.

Againe, ſometime in the yére you ſhall ſée the moone rather then at ſome other time, as this for example.

From January to June, you ſhall ſée the moone within foure and twentie houres after the change, becauſe ſhe hath

North

North declination of the Sunne, and maketh a bigger Arch then the Sunne.

From July to December, you shall not see the moone three daies after the change, because her declination is to the South part of the Sunne: but you may see her in foure and twentie houres before her change. Now the Sea-men doe imagine a Prime day, which is the halfe quarter of the moone: that is, when the moone is three daies and eighteene houres old, (the moone being then foure points to the East-ward of the Sunne, which is three houres:) the same rule may they in like case observe when the moone is past the full three daies and eighteene houres, and also in the middest of the quarters.

Here followeth a Table of Tides.

First, the Moone South or North, on Lands end full Sea.

The Moone South and by East, at the Gore end full sea.

The moone South Southwest, betweene holy Iland and Tinemouth, full sea.

It floweth betweene Tinemouth and Flamborough head, South-west and North-east moone.

It floweth betweene Flamborough head, and Bridlington in the Bay, a south-west and by west moone.

The moone in the west south-west, betweene Bridlington and Laurenas, full sea.

It floweth betweene Laurenas and Cromer all along the west: an East and West moone.

It floweth betweene Cromer and Yarmouth Rode, to Layston North Rode, a southeast moone.

It floweth betweene Layston Rode and Orfordenas, a south-east and by south moone.

It floweth betweene Orford and Orewel wanes, a south south-east moone.

It floweth betwéne the Nas and the Ware head of Colne, a south and by East mone.

It floweth at the Spittes, and at the Shene, and all alongst the Swinne, a south mone.

At the West end of the Noze, a south and by west mone, full sea.

It floweth at Gzauesend, a south southwest mone.

It floweth at London bzidge, a southwest mone.

It floweth at the Nozth Fozland, a South Southeast mone, and so alongst the coast till you come to Wechey. And in the Offing from the Nozth Fozland to the South Fozland, it runneth halfe tide. And from the south fozland to the Nas, the tide runneth halfe tide halfe quarter. And from the Nas to Fairely, it runneth halfe tide: and from Fairely to Wech, it runneth quarter tide vnder other.

It floweth to the Westward of Wech, a kenning, a southeast and by south mone.

It floweth at Pozteſmouth, a South and by East mone.

It floweth at S. Clens a south southeast mone.

It floweth on the sea side of the Iland, a southeast and by south moone: and so on the land, and at the Nadles, it runneth quarter tide in the Offing.

It floweth at Pole in the hauen: a southeast mone.

It floweth at Waymouth: an East and west mone.

It floweth at Poztland: a southeast mone.

It floweth from the west part of Poztland, till you come vnto Plimmouth, an East and West mone.

It floweth on the shoze from Plimmouth to the Lyzard, a West and by south mone. And in the Offing a Southeast mone.

It floweth at Mounts Baye: an East and West mone.

It floweth at Selly: a West and by south mone.

It floweth at the Lands end of Owle: a West southwest mone.

It floweth all alongst the coast by to Bzistow, and the

coast

coast of Ireland, from Waterford to Kinsale, a West and by South moone.

Furthermore it floweth (for the most part) from the Wolf head of Bardeaux all along the coast of Biskey, Galyza, Portingale, till you come to the straights of Paliga, a South-west and Northeast moone.

It floweth at Flushing, a southwest and by south moone.

It floweth at Antwerp an East and West moone.

It floweth all alongst the coast of Flanders, from the Wildings to Calys, a South & by East moone: and so runneth halfe tide vnder the other.

Now there is one speciall thing to be noted, and that is this: It floweth one point of the Compasse more in the spring streames, then it doth in any of the quarters of the moone, (so that it be a River where there is any indraft, having distance from the Sea) when there is neither rage of windes, nor any cause either to hinder or further the said effect. It will flowe point of the compasse more in the spring-tides than in the neap.

As for example, thus: It floweth at Gravesend at the chaunge of the Moone or full, a south southwest moone. But in any of the quarters of the moone it scant floweth, a South and by West Moone: and this is generall for ever. Tides in a river that hath any distance vnto the sea.

The fourth Chapter treateth of the Sunne and Moones course in the Zodiacke: and how you shall know what houres the Moone shall rise and set at: and at what point of the Compasse, with other necessarie things.

FUrthermore, the Sun (by his naturall mouing through the 12. signes in the Zodiacke in the yere) doth cause the height and lownesse of his declination: which is necessarie for the Sea-faring men to know, the which declination they doe take from Equinoctiall to Equinoctiall. And this is to be

be noted, that as the Sunne hath declination, so in like manner hath the Moone, for by her declination and the Sun, is knowne the time of her shining or abiding above our Horizon.

To know how long the Moone shineth.

The Sunne or Moone in the first minute of Aries, do rise East, and set West, and shine twelue houres. In the first minute of Taurus, they rise nére the East Northeast, and set nére the West Northwest, and shine somewhat more then 14. houres. In the signe of Gemini, they rise nére the Northeast and by East, and they set nére the Northwest and by West, and shine nére fifteene houres. In the signe of Cancer, the first minute, they make their greatest declination to the Northwards, and they rise nére the North-east, and set nére the North-west, and shine nére 16. houres and a halfe. In the first minute of Leo, (descending towards the equinoctiall) as they did in Gemini. And in the signe of Virgo, as they did in Taurus. And in the first minute of Libra, Equinoctiall: beginning south declination, as in Aries. And in the first minute of Scorpio, they rise nére the East south-east, and set nére the west south-west, and shine ten houres. In the first minute of Sagittarius, they rise nére the south-east & by east, and set nére the South-West and by west, and shine eight houres. In the first minute of Capricornus, they haue their greatest declination to the south, and begin to returne to the equinoctiall, rising nére the south-east, and setting nére the south west, and shine seauen houres and a halfe. In the first minute of Aquarius, as in Sagittarius. In the first minute of Pisces, as in Scorpio.

To know when the Sunne riseth and setteth.

By this meanes, you may know the time of the Sunnes rising and setting in this manner. Diuide the time of the Sunnes shining, or continuance above the Horizon into two equall parts: the one part sheweth the time of his setting: and it being inducted from 12. sheweth the time of his rising. As for example: because the Sun being in Cancer, as is aforesaid, shineth 16. houres and an halfe, therefore I diuide that time into two equall parts (whereof the one is 8.

houres

16:30 12:00
08:15
Rising in ♋ begin Cancer 08:15 3:45
setting rising

houres and one quarter) and say that the Sunne setteth a quarter of an houre after eight, this number being subducted from 12. declareth the Sunne to arise three quarters after three in the morning.

To know when the Moone riseth and setteth.

Also by this rule you may know the time of the rising and setting of the Moone for ever. But before I say any more of that matter, here is to be noted, that when the Moone changeth, then the Sunne and she are both in one degree of the Ecliptick, and therefore they arise at one time, and upon one point of the compasse, and continue above the Horizon both a like time. When the Moone is at the full, the Sunne and she are opposite one against the other, and five signes asunder, so that she ariseth at the same time when the Sunne setteth, and setteth when the sunne ariseth, but upon the contrarie point of the compasse. And if the time of the continuance of the Sunne above the Horizon be subducted out of 24. houres, the remainder sheweth the continuance of the Moone above the Horizon. The quarters be when the Sunne and Moone are 3. signes asunder, that is 90. degrees. Moreover from the change of the Moone to the full, the moone ariseth after the Son, and setteth after him: but from the full to the change, the Moone ariseth and setteth before the Sunne. Therefore if at these intermiddle times between the change and the full, and the full and the change againe, you desire to know the time of the rising and setting of the Moone, note this: I have shewed you before, speaking of the shifting of the Sunne and Monne, that every day of the age of the moone, the moone goeth Eastward one point and three minutes, so that you must looke how many daies the moone is old, then put so many points, and so many three minutes together, and convert them into houres: if the number be lesser then twelue, it sheweth how long the Moone riseth after the Sunne. But if the said number be more then 12. cast away twelue, and the remainder sheweth how long the Moone ariseth before the Sun. The

time of her arising being once knowne, the time of her setting is easily known. For as many houres as she continueth in the East aboue the Horizon before she commeth to the South, so many houres she continueth in the West before she setteth vnder the Horizon after she is past the South, as for example thus. In March alwaies the Sunne is in Aries, then the moone being in her first quarter, is fiue houres to the East ward of the Sunne, then the moone must néds be in Cancer. Then shineth the Moone in our Horizon 16. houres and a halfe, and is South at fiue of the clock, and shineth 8. houres and a quarter after 6. of the clock. So that she setteth at 2. of the clocke and a quarter of an houre past, and riseth in the day 8. houres and a quarter before 6. of the clock, that is, at 9. of the clocke, and 3. quarters of an houre past. Now at the last quarter in March, then the moone must néds be in Capricornus, and shineth but 7. houres and a halfe, and is south at 6. of the clock in the morning, and riseth 3. houres and 3. quarters before, that is 2. of the clock and a quarter of an houre past in the morning. and she setteth by day at 9. of the clock, and 3. quarters of an houre past: and this rule will serue for euer, without any great errour. But yet there is a further matter for the exact doing, which is the latitude of the moone from the head or taile of the Dragon.

Ensample of the moones rising and setting.

The Moone hath Latitude.

And now for to shew vnto you when that the Moone is with the head and the taile of the Dragon, as I haue in the third Chapter said vnto you, there are but few sea-men that doe know the moones Theorickes, for they cannot tell when that the Moone is in her swift or slow motion. So in like maner it is necessary for to know the mones Latitude from the line Ecliptick, & also of which side of the line Ecliptick, which is knowne by the head or taile of the Dragon. For when that the moone hath passed 90. degrées from the head of the Dragon, then the moone hath Latitude 5. degrées vnto the North parts of the line Ecliptick, & also if that the moone be 90 degrées from the Dragons taile, then the moone hath latitude 5. degrées vnto the south parts of the line Ecliptick,

So

So that the Dragons head is no other thing, but the crossing or passing of the Moone from the South partes vnto the North part of the line Ecliptick. So in like manner the Dragons taile is the crossing or passing of the Moone ouer the line Ecliptick from the North part vnto the South parts of the line Ecliptick. The effects hereof is this, if the Moone doth come with the head or taile of the Dragon at her opposition or full, then she shall be Eclipsed because the shadow of the earth is séene vpon the Moone, and these Eclipses be generall throw the face of the whole earth, if that the Moone be aboue the Horizon. And in like maner, if that the Moone doth come with the head or taile of the Dragon at the coniunction or change of the Moone, then the Sunne is eclipsed, for that the Moone commeth betwéene the Sunne and the earth; but these eclipses are not generall, for that the Diameter of the earth is more then fiue times the Diameter of the Moone: and also the Moone commeth very néere vnto the earth in respect of the great distance that the Sunne is from the earth, so that the Sun may be eclipsed in one place but not in another, which doth happen by the Moones Paralare, as afore I haue shewed &c. And now for to know where the Dragons head is, note this, when that the Prime is one, then the Dragons head is in the first part of Aries, as the point of Auge is. But their motions are contrarie: For as the point of Auge is in Aries, and from thence commeth into Taurus, and so successiuely proceedeth through the 12. signes in 19. yéres. So the Dragons head doth passe through the 12 signes in 19. yéres backwards, for being in Aries, it commeth into Pisces, and thence into Aquaries, &c. So that in 9. yéres & a halfe, the Dragons head is in Libra, and doth méete with the point of Auge, &c.

And now for to know the Moones Latitude marke this, the Prime one, the Dragons head is in Aries, whereby it may be inferred that the Mone in Cancer, is 90. Degrées from the Dragons head, and hath her farthest distance from the line Ecliptick, that is fiue degrées. So that the Moone

decline fiue degrées more vnto the Northwards then the Sunne doth, and her whole declination is 28 degrées and a halfe from the Equinoctiall, touching the Dragons taile which is alwaies opposite vnto the Dragons head, the Prime being one, the Dragons taile is in Libra. Item the Moone passing Cancer, commeth nerer the Ecliptick, and in Libra she crosseth the line Ecliptick, and when she is come into Capricorne, then shée is fiue degrées vnto the Southwards of the line Ecliptick, and declineth 28. degrées and a halfe vnto the Southwards of the Equinoctiall. So that the Moone doth decline in all, (medling not with the Moones Paralare) 57. degrées the Prime being one, in nine yéres and a halfe, the Dragons head shall be in Libra, and the taile in Aries, and then the Moone in the signe of Libra, shall passe ouer the line Ecliptick from the South part to the North part. So that the Moone in the signe of Capricorne, is fiue degrées vnto the North of the line Ecliptick, and then shée doth decline but 18. degrées and a halfe from the Equinoctiall to the South parts, so in the signe of Aries, the Moone shall passe ouer the line Ecliptick from the North vnto the South and then in Cancer the Moone is fiue degrées vnto the South of the line Ecliptick, and doth decline 18. degrées vnto the North parts of the Equinoctial, so that the Moones whole declination, is but 37. degrées. So when the Prime is one, the declination of the Moone is more by 20. degrées, then when the Prime is betwéene nine and ten yéres, and when the Prime is neere fiue, then the Dragons head is in Capricornus. And when the Prime is 14. or 15. the Dragons head is in Cancer. So that in 19. yéres the Dragons head doth passe through the twelue signes backwards.

Thus by knowing what the Prime is, you may know where the Dragons head is, and also the Dragons tayle, and then that known, you may know the Moones latitude, from the line Ecliptick, and of which side: For when the Moone is in the Dragons head, then she passeth ouer from the South vnto the north part, but when she is with the Dragons tayle

then

then she passeth ouer from the North vnto the South part of the line Ecliptick, and then when that the Moone is halfe way betweene the head and the tayle of the Dragon, then is she fiue degrées in Latitude from the line Ecliptick, that is to say, if that shée come from the head of the Dragon, she is fiue degrées on the North side, if from the taile, then is she fiue degrées on the South side of the line Ecliptick: and this I doe thinke sufficient for instruction. Here (as before) I could wish that sea-faring men or others, would not leane too much vnto these rules of the Prime, concerning the finding out of the true place of the Dragons head or tayle, because they are vncertaine, but I would wish them to sticke vnto the Ephemerides, wherein to saue their labour these things are seuerally set downe with more certaintie.

Yet there is one thing which I would Sea-faring men should consider, although a great number be expert in that, yet it is méet to be spoken of, as this. The sun being in Cancer, or Moone in like manner, or in Gemini, or any time when the Sunne or Moone hath North declination, they will set their Compasse before them, and when they sée the Sun giue an East shadow, they will say that it is six of the clock, whereas if the Sunne be in Cancer, it is not much past fiue of the clock, and the farther they are to the Southwards, the more they do erre: and in like case the moone being in Cancer, when she do sée the moone giue an east shadow by their compasse, they will say the moone is west, but they do not consider that the Sun and the Moone being in Cancer, commeth too nére our Zenith or verticall point right ouer our head, (which is the very height of their declination) that the position of their shadow can hardly be discerned, therfore they must iudge the east or west frō the pole or North star, if they will iudge truly.

You cannot know what a clocke it is by the compasse, the Sunne being in the North signes.

Errour of the shadow of the Moone.

Wherefore I doe much commend the Equinoctiall dyals for the exact truth, for they cannot know the truth by their Compasse, if that the Sun or Moone, or any other starre, haue any great declination, being in Cancer: so you must consider this in like maner. The Sun hauing North declination,

The Equinoctiall dials be very good.

the further you do go to the Northwards, the longer is your day, and the shorter is your night, and towards the Southwards the shorter daies and longer nights.

As touching the length and shortnesse of the day and night.

Now contrariwise, the Sunne hauing South declination, the more to the Northwards, the shorter daies and the longer nights, the further to the Southwards, the longer daies and shorter nights, and vnder the Equinoctiall, the nights and daies all one, what declination soeuer the Sun hath: but this rule that I haue giuen you is for London, or any other place that hath North Latitude for the elenation of the Pole Arcticke.

The fift Chapter is of a Table of declination, commonly called of Sea-faring men, *A Regiment of the Sun*, exactly calculated for foure yeeres, and will serue for twentie foure yeeres, for euery day of the moneth.

AND in like manner as I haue said somewhat of the Moones motion, so I do thinke it conuenient for to say somewhat of the Sunnes motion, for that it is necessarie for Sea-men for to know, the Sunnes place in the Zodiacke, whereby that they may calculate or count the Sunnes declination truly, and as I haue shewed before, that the Sunne doth passe through the Zodiacke in 365. daies, fiue houres, fiftie fiue minutes, 26. seconds, and hath three motions as the Moone hath. In the point of Auge is the Sunnes slow motions, and then the Sunne passeth or goeth but little more then fiftie seuen minutes in 24. houres, and in the opposition of Auge, the Sun passeth or goeth one degrée and néere two minutes in 24. houres, that is more by fiue minutes almost in his swift motion then in his slow motion. The point of Auge is now in this age of the world in the signe of Cancer, but not in the Solstitiall point, where

where that the Sun hath his greatest declination, and also the oppositon of Auge is in Capricorne, but not there where the sunne hath his greatest declination. Now by the meanes of the three motions of the sunne, it falleth out that the Equinoctiall points be not euen, for that there are more daies from the Equinoctiall of March, vnto the Equinoctiall of September, by neere nine dayes, then there is from the Equinoctiall of September, vnto the Equinoctiall of March, for that there is from the eleuenth day of March vnto the 14. day of September, 187. daies, & there is but 187. daies from the 14. day of September, vnto the 11. day of March. And the reason is this as I haue said before, because that in the latter part of June the Sunne is in his slow motion, and also in the latter part of December, hee is in his swift motion: & this doe I thinke sufficient for instructions in this matter, for that the Sea-men haue no farther to do with the Sunnes motion, but only from the true place of the Sunne to seeke the true declination of it: and also the most part of sea-men haue vsed Spanish Regiments, and thinking that those would haue serued for euer, which is most contrary, for if that it be neuer so truely calculated, yet it groweth after twentie foure yeeres vnto errour.

For as often as euery yeere of Bissextilis doth come about, which is euery foure yeere, the Sunne is sooner in the Equinoctiall by more then halfe an houre, &c.

Now shall follow a Table of declination or Regiment for foure yeeres, being calculated for the Longitude of 24. d. and will serue all Europe without much errour, or any other countrie or place that hath the same Longitude, as the most part of Africa, Ginnie, and those parts to the southwards, as farre as the Antartick Pole, serving for euery day of the moneth, very necessarie for them that do vse to trauaile either by sea or by land, & is one of the principall points in Nauigation, for long voiages, and the cause why I haue written this Regiment for the Sea, or Tables of declination, is for that I doe know that euery person that goeth vn-

Euery person cannot calculate the sunnes declination.

to the sea, as Master of a ship, hath not capacitie to calculate the sunnes declination, by the place of the Sunne, although they haue the Tables of declination, as the Ephemerides of Martine Cunise, otherwise called the Art of Nauigation. Wherefore I haue written these notes and Regiment or Table of declination for foure yéres, and the first row towards your left hand, is the dayes of the moneth: the next row is the degrées of declination that the sunne hath at the instant time of noone: and the third row is the oode minutes of declination belonging to the degrées.

Two times in the yeere the Sunne hath declination. 1577.

Now there be two times in the yére that the sunne hath no declination, as this: For the first yére after Bissextilis, (which is in the yére of our Lord 1609. the 10. day of March, betwéene 8 and 9 of the clock at night) the Sunne will be in the Equinoctiall beginning North declination. And in like manner the 13. day of September betwéene 9. and 10. a clocke, the Sunne will be in the Equinoctiall beginning South declination, and also the second yére after Bissextilis, which is the yére of our Lord 1610. the sunne is in the Equinoctiall 11. day of March, betwéene 2. and 3. of the clocke before noone, beginning North declination, and in like manner the 13. day of September betwéene 3. and 4. of the clocke in the after noone, beginning South declination.

Furthermore, in the third yére after Bissextilis which is the yére of our Lord 1611. the sunne is in the Equinoctiall the 11. day of March, betwéene 8. and 9. of the clocke in the morning, beginning North declination, and so in like manner the 13. day of September betwéene 9 and 10. of the clocke at night, beginning South declination.

Lastly in the yére of our Lord 1612. that is, the yére Bissextilis it selfe. Upon the 10. day of March, the Sun shall be in the Equinoctiall about 3. of the clocke after noone, beginning North declination: and in like manner the 13. day of September, betwéene 3. and 4. of the clocke in the morning

morning, beginning South declination: Now these foure yéeres being expired you must begin againe at the yéere Biſſextilis or leape yéere, as here doth follow for example. And so it will serue for neere twentie yéeres to come.

Yeere. 1	Yeere. 2	Yeere. 3	Yeere. Biſſextilis
1609	1610	1611	1612
1613	1614	1615	1616
1617	1618	1619	1620
1621	1622	1623	1624
1625	1626	1627	1628

To the Reader of this Regiment.

GEntle Reader I haue painefully and truely calculated this Regiment for your vſe, and deſire you to perſwade your ſelfe ſo. If it ſhal ſeeme otherwiſe, either it ſo falleth out by meanes of your obſeruation, or in reſpect of the place in which you are, which may alter the place of the Sunne and conſequently his declination diuerſly. Therfore if your expectation in ſearching the eleuation of the Pole by this Regiment be not fully anſwered, let not my labour be vnaduiſedly reproued, leſt I be diſcouraged, but let the fault remaine where it is. In my booke called the Mariners eaſe which is ſhortly to come forth, beſides many things elſe fit for your vſe, you ſhall haue an ample Table for the Sunnes declination, calculated for euery degree and minute of the Eclipticke. By the which Table you ſhall be ſufficiently and plainely inſtructed how to finde out the declination of the Sunne in any place whereſoeuer you are.

Vntill then I reſt yours

Thomas Hood.

January.				February				March.		
D.	G.	M.		D.	G.	M.		D.	G	M.
1	21	48		1	14	0		1	3	42
2	21	38		2	13	39		2	3	18
3	21	28	South.	3	13	19	South Declination.	3	2	5
4	21	17		4	13	0		4	2	31
5	21	7		5	12	39		5	2	7
6	20	55		6	12	18		6	1	43
7	20	43		7	11	57		7	1	20
8	20	30		8	11	36		8	0	57
9	20	19		9	11	15		9	0	33
10	20	6		10	10	52	Sunne in the	10	0	10
11	19	53		11	10	32	Equinoctiall	11	0	15
12	19	40		12	10	10		12	0	38
13	19	25		13	9	48		13	1	2
14	19	11		14	9	26		14	1	26
15	18	57		15	9	4		15	1	49
16	18	41		16	8	40		16	2	13
17	18	26		17	8	19		17	2	36
18	18	10		18	7	56		18	3	0
19	17	54		19	7	33		19	3	23
20	17	37		20	7	10		20	3	46
21	17	20		21	6	47		21	4	9
22	17	4		22	6	25		22	4	32
23	16	46		23	6	2		23	4	56
24	16	29		24	5	39		24	5	18
25	16	12		25	5	16		25	5	42
26	15	53		26	4	52		26	6	4
27	15	35		27	4	29		27	6	27
28	15	16		28	4	6		28	6	49
29	14	57						29	7	12
30	14	38						30	7	34
31	14	19	Declination.				North Declination.	31	7	57

1609. The first after the Leape yeere.

Aprill.				Maie.				Iune.		
D.	G.	M.		D.	G.	M		D.	G	M.
1	8	19	North. Declination.	1	17	52	North. Declination.	1	23	6
2	8	41		2	18	8		2	23	10
3	9	2		3	18	23		3	23	14
4	9	24		4	18	37		4	23	17
5	9	45		5	18	52		5	23	20
6	10	7		6	19	6		6	23	22
7	10	28		7	19	20		7	23	24
8	10	49		8	19	33		8	23	25
9	11	10		9	19	46		9	23	26
10	11	30		10	19	59		10	23	27
11	11	51		11	20	11	Solstice.	11	23	28
12	12	11		12	20	23		12	23	28
13	12	32		13	20	35		13	23	28
14	12	52		14	20	46		14	23	27
15	13	11		15	20	57		15	23	26
16	13	30		16	21	8		16	23	24
17	13	49		17	21	18		17	23	22
18	14	9		18	21	28		18	23	20
19	14	27		19	21	38		19	23	16
20	14	46		20	21	47		20	23	13
21	15	4		21	21	56		21	23	9
22	15	21		22	22	4		22	23	4
23	15	39		23	22	12		23	23	0
24	15	57		24	22	19		24	22	55
25	16	15		25	22	26		25	22	50
26	16	31		26	22	33		26	22	44
27	16	48		27	22	40		27	22	37
28	17	5		28	22	46		28	22	31
29	17	20		29	22	52		29	22	24
30	17	36		30	22	57		30	22	16
				31	23	2				

Iuly.				Auguſt.				Septem.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	22	8	North.	1	15	20	North Declination.	1	4	36
2	22	0		2	15	2		2	4	13
3	21	52		3	14	44		3	3	50
4	21	44		4	14	25		4	3	26
5	21	34		5	14	6		5	3	4
6	21	24		6	13	47		6	2	14
7	21	15		7	13	28		7	2	18
8	21	4		8	13	9		8	1	54
9	20	54		9	12	50		9	1	31
10	20	43		10	12	31	Sunne in the	10	1	8
11	20	31		11	12	11	Equinoctiall	11	0	44
12	20	20		12	11	50		12	0	21
13	20	8		13	11	29		13	0	3
14	19	55		14	11	9		14	0	26
15	19	42		15	10	47		15	0	50
16	19	30		16	10	27		16	1	14
17	19	17		17	10	7		17	1	36
18	19	2		18	9	46	South Declination.	18	2	0
19	18	48		19	9	25		19	2	23
20	18	34		20	9	3		20	2	47
21	18	20		21	8	41		21	3	11
22	18	4		22	8	20		22	3	34
23	17	50		23	7	58		23	3	57
24	17	34		24	7	37		24	4	20
25	17	17		25	7	14		25	4	44
26	17	3		26	6	52		26	5	6
27	16	45		27	6	29		27	5	30
28	16	29		28	6	7		28	5	52
29	16	11		29	5	44		29	6	15
30	15	55		30	5	22		30	6	38
31	15	37		31	4	58				

October.				Nouemb.				Decemb.		
D.	G.	M.		D.	G.	M		D.	G.	M.
1	7	1	South.	1	17	26	South.	1	23	2
2	7	24		2	17	42		2	23	6
3	7	47		3	18	0		3	23	11
4	8	10		4	18	15		4	23	15
5	8	32		5	18	30		5	23	18
6	8	54		6	18	46		6	23	21
7	9	15		7	19	1		7	23	23
8	9	37		8	19	15		8	23	25
9	9	58		9	19	30		9	23	27
10	10	20		10	19	44		10	23	28
11	10	42		11	19	58	Solstice.	11	23	28
12	11	3		12	20	10		12	23	28
13	11	24		13	20	22		13	23	28
14	11	45		14	20	34		14	23	27
15	12	6		15	20	46		15	23	26
16	12	26		16	20	58		16	23	23
17	12	48		17	21	9		17	23	21
18	13	8		18	21	20		18	23	19
19	13	28	Declination.	19	21	30	Declination.	19	23	15
20	13	48		20	21	40		20	23	12
21	14	8		21	21	49		21	23	8
22	14	27		22	21	58		22	23	3
23	14	46		23	22	8		23	22	58
24	15	6		24	22	16		24	22	52
25	15	24		25	22	24		25	22	47
26	15	42		26	22	31		26	22	40
27	16	0		27	22	38		27	22	33
28	16	18		28	22	45		28	22	25
29	16	35		29	22	51		29	22	18
30	16	53		30	22	57		30	22	10
31	17	10						31	22	0

1610. The second after the Leape yeere.

January.			South.	Declination.	February			South Declination.	Sunne in the Equinoctiall	North Declination.	March.		
D.	G.	M.			D.	G.	M.				D.	G.	M.
1	21	52			1	14	6				1	3	48
2	21	42			2	13	46				2	3	24
3	21	32			3	13	25				3	3	0
4	21	22			4	13	5				4	2	38
5	21	10			5	12	45				5	2	14
6	20	59			6	12	25				6	1	50
7	20	48			7	12	4				7	1	26
8	20	37			8	11	42				8	1	3
9	20	24			9	11	21				9	0	39
10	20	11			10	11	0				10	0	15
11	19	58			11	10	38				11	0	9
12	19	44			12	10	16				12	0	32
13	19	30			13	9	54				13	0	56
14	19	16			14	9	23				14	1	20
15	19	1			15	9	10				15	1	42
16	18	46			16	8	48				16	2	6
17	18	31			17	8	25				17	2	30
18	18	16			18	8	2				18	2	53
19	18	0			19	7	40				19	3	17
20	17	44			20	7	17				20	3	40
21	17	26			21	6	54				21	4	4
22	17	10			22	6	31				22	4	26
23	16	53			23	6	8				23	4	50
24	16	35			24	5	45				24	5	13
25	16	17			25	5	21				25	5	36
26	16	0			26	4	58				26	5	59
27	15	41			27	4	35				27	6	21
28	15	22			28	4	11				28	6	44
29	15	3									29	7	6
30	14	45									30	7	29
31	14	25									31	7	51

Aprill.				Maie.				Iune.		
D.	G.	M.		D.	G.	M		D.	G.	M.
1	8	13		1	17	49		1	23	5
2	8	35		2	18	4		2	23	9
3	8	57	North.	3	18	19	North.	3	23	13
4	9	19		4	18	34		4	23	16
5	9	40		5	18	48		5	23	19
6	10	1		6	19	2		6	23	21
7	10	23		7	19	16		7	23	23
8	10	43		8	19	29		8	23	25
9	11	5		9	19	42		9	23	26
10	11	25		10	19	55		10	23	27
11	11	45		11	20	8	Solstice.	11	23	28
12	12	6		12	20	20		12	23	28
13	12	26		13	20	32		13	23	28
14	12	46		14	20	43		14	23	27
15	13	6		15	20	55		15	23	26
16	13	25		16	21	5		16	23	24
17	13	45		17	21	15		17	23	22
18	14	4		18	21	25		18	23	20
19	14	24		19	21	35		19	23	17
20	14	42		20	21	45		20	23	14
21	15	0		21	21	54		21	23	10
22	15	19		22	22	2		22	23	5
23	15	36		23	22	10		23	23	1
24	15	54		24	22	18		24	22	57
25	16	11		25	22	25		25	22	52
26	16	28		26	22	32		26	22	46
27	16	45		27	22	38		27	22	39
28	17	1		28	22	44		28	22	32
29	17	17		29	22	50		29	22	26
30	17	32		30	22	56		30	22	19
				31	23	1				

Declination. Declination.

July.				August.				Septem.		
D.	G.	M.		D.	G.	M.		D	G	M
1	22	11	North.	1	15	24	North Declination.	1	4	42
2	22	3		2	15	7		2	4	19
3	21	54		3	14	48		3	3	56
4	21	45		4	14	30		4	3	33
5	21	37		5	14	12		5	3	10
6	21	27		6	13	52		6	2	47
7	21	17		7	13	32		7	2	23
8	21	7		8	13	15		8	1	59
9	20	56		9	12	54		9	1	36
10	20	45		10	12	35	Sunne in the	10	1	13
11	20	34		11	12	16	Equinoctiall	11	0	50
12	20	23		12	11	55		12	0	27
13	20	10		13	11	35		13	0	3
14	19	58		14	11	14		14	0	20
15	19	45		15	10	53		15	0	44
16	19	32		16	10	33		16	1	7
17	19	19		17	10	12		17	1	31
18	19	5		18	9	50	South Declination.	18	1	54
19	18	52		19	9	30		19	2	8
20	18	38		20	9	8		20	2	41
21	18	23		21	8	47		21	3	4
22	18	8		22	8	25		22	3	28
23	17	53		23	8	3		23	3	51
24	17	38		24	7	41		24	4	14
25	17	21		25	7	19		25	4	37
26	17	5		26	6	56		26	5	0
27	16	49		27	6	34		27	5	23
28	16	33		28	6	12		28	5	46
29	16	16		29	5	50		29	6	9
30	16	0		30	5	27		30	6	32
31	15	42		31	5	4				

Declination.

October.			South.	Declination.
D.	G.	M.		
1	6	55		
2	7	18		
3	7	40		
4	8	3		
5	8	25		
6	8	47		
7	9	9		
8	9	31		
9	9	53		
10	10	15		
11	10	36		
12	10	57		
13	11	19		
14	11	40		
15	12	1		
16	12	22		
17	12	42		
18	13	2		
19	13	22		
20	13	42		
21	14	2		
22	14	22		
23	14	41		
24	15	0		
25	15	19		
26	15	37		
27	15	55		
28	16	13		
29	16	30		
30	16	48		
31	17	5		

Nouemb.			South.	Declination.
D.	G.	M.		
1	17	22		
2	17	38		
3	17	55		
4	18	11		
5	18	26		
6	18	42		
7	18	57		
8	19	11		
9	19	26		
10	19	40		
11	19	53	Solstice.	
12	20	7		
13	20	19		
14	20	32		
15	20	44		
16	20	56		
17	21	6		
18	21	17		
19	21	28		
20	21	38		
21	21	48		
22	21	56		
23	22	5		
24	22	14		
25	22	22		
26	22	29		
27	22	36		
28	22	43		
29	22	50		
30	22	55		

Decemb.		
D.	G.	M
1	23	0
2	23	5
3	23	10
4	23	14
5	23	17
6	23	20
7	23	22
8	23	24
9	23	26
10	23	27
11	23	28
12	23	28
13	23	28
14	23	27
15	23	26
16	23	24
17	23	22
18	23	19
19	23	16
20	23	13
21	23	9
22	23	4
23	22	59
24	22	54
25	22	48
26	22	41
27	22	34
28	22	27
29	22	20
30	22	12
31	22	3

anuary.				Februarie				March.		
D.	G.	M.		D.	G.	M.		D.	G	M
1	21	53	South.	1	14	11	South Declination.	1	3	54
2	21	44		2	13	51		2	3	30
3	21	35		3	13	30		3	3	7
4	21	24		4	13	10		4	2	45
5	21	13		5	12	50		5	2	21
6	21	3		6	12	30		6	1	55
7	20	51		7	12	9		7	1	32
8	20	39		8	11	48		8	1	9
9	20	27		9	11	26		9	0	45
10	20	14		10	11	5	Sunne in the	10	0	21
11	20	01		11	10	48	Equinoctiall	11	0	3
12	19	49		12	10	22		12	0	27
13	19	34		13	10	0		13	0	50
14	19	20		14	9	38		14	1	14
15	19	5		15	9	16		15	1	37
16	18	50		16	8	54		16	2	0
17	18	35		17	8	31		17	2	24
18	18	20		18	8	8		18	2	47
19	18	3	Declination.	19	7	46	North Declination.	19	3	11
20	17	47		20	7	23		20	3	34
21	17	31		21	7	0		21	3	58
22	17	13		22	6	36		22	4	21
23	16	57		23	6	13		23	4	45
24	16	40		24	5	50		24	5	8
25	16	21		25	5	27		25	5	31
26	16	4		26	5	3		26	5	54
27	15	46		27	4	40		27	6	16
28	15	27		28	4	16		28	6	39
29	15	9						29	7	1
30	14	49						30	7	24
31	14	30						31	7	46

April.				Maie.				Iune.		
D.	G.	M.		D.	G.	M		D.	G.	M.
1	8	8	North. Declination.	1	17	45	North. Solstice.	1	23	4
2	8	30		2	18	1		2	23	8
3	8	52		3	18	15		3	23	12
4	9	14		4	18	30		4	23	16
5	9	35		5	18	45		5	23	18
6	9	56		6	18	59		6	23	21
7	10	18		7	19	13		7	23	22
8	10	39		8	19	27		8	23	24
9	11	0		9	19	40		9	23	26
10	11	20		10	19	52		10	23	27
11	11	41		11	20	4		11	23	28
12	12	1		12	20	17		12	23	28
13	12	22		13	20	29		13	23	28
14	12	42		14	20	40		14	23	27
15	13	1		15	20	52		15	23	26
16	13	21		16	21	3		16	23	24
17	13	40		17	21	13		17	23	22
18	14	0		18	21	24		18	23	30
19	14	19		19	21	33		19	23	17
20	14	37		20	21	43		20	23	14
21	14	55		21	21	51		21	23	11
22	15	14		22	22	0		22	23	6
23	15	32		23	22	8		23	23	2
24	15	49		24	22	15		24	22	58
25	16	7		25	22	23		25	22	52
26	16	24		26	22	30		26	22	47
27	16	40		27	22	36		27	22	41
28	16	57		28	22	43		28	22	34
29	17	13		29	22	49		29	22	27
30	17	28		30	22	54		30	22	20
				31	22	59				

July.				August.				Septem.		
D.	G.	M.		D.	G.	M.		D	G	M.
1	22	21	North.	1	15	21	North Declination.	1	4	47
2	22	5		2	15	10		2	4	24
3	21	56		3	14	53		3	4	1
4	21	47		4	14	34		4	3	38
5	21	39		5	14	16		5	3	15
6	21	29		6	13	57		6	2	52
7	21	20		7	13	38		7	2	19
8	21	9		8	13	18		8	2	5
9	20	59		9	12	59		9	1	41
10	20	48		10	12	40	Sunne in the	10	1	19
11	20	37		11	12	21	Equinoctiall	11	0	56
12	20	25		12	12	0		12	0	32
13	20	13		13	11	40		13	0	8
14	20	1		14	11	19		14	0	15
15	19	49		15	10	59		15	0	38
16	19	35		16	10	38		16	1	1
17	19	22		17	10	17		17	1	25
18	19	9		18	9	56		18	1	48
19	18	55		19	9	34		19	2	11
20	18	41		20	9	13		20	2	35
21	18	27		21	8	52		21	2	59
22	18	12		22	8	31		22	3	22
23	17	57		23	8	9		23	3	45
24	17	41		24	7	47		24	4	9
25	17	25		25	7	25		25	4	31
26	16	10		26	7	2		26	4	54
27	16	54		27	6	40		27	5	18
28	16	37		28	6	18		28	5	41
29	16	20		29	5	55		29	6	4
30	16	4		30	5	32		30	6	27
31	15	46		31	5	10				

South Declination.

October.				Nouemb.				Decemb		
D.	G.	M.		D.	G.	M		D.	G.	M.
1	6	49	South.	1	17	18	South.	1	22	59
2	7	12		2	17	35		2	23	4
3	7	35		3	17	51		3	23	8
4	7	58		4	18	7		4	23	12
5	8	19		5	18	22		5	23	16
6	8	42		6	18	38		6	23	19
7	9	4		7	18	53		7	23	22
8	9	26		8	19	7		8	23	23
9	9	48		9	19	22		9	23	25
10	10	10		10	19	36		10	23	27
11	10	32		11	19	50	Solstice.	11	23	28
12	10	53		12	20	3		12	23	28
13	11	14		13	20	16		13	23	28
14	11	35		14	20	29		14	23	27
15	11	56		15	20	41		15	23	26
16	12	17		16	20	53		16	23	24
17	12	38		17	21	4		17	23	22
18	12	58		18	21	15		18	23	20
19	13	18	Declination.	19	21	24	Declination.	19	23	17
20	13	38		20	21	35		20	23	14
21	13	58		21	21	45		21	23	10
22	14	18		22	21	54		22	23	5
23	14	36		23	22	3		23	23	0
24	14	55		24	22	12		24	22	55
25	15	14		25	22	20		25	22	50
26	15	33		26	22	27		26	22	43
27	15	51		27	22	34		27	22	36
28	16	9		28	22	41		28	22	28
29	16	27		26	22	48		29	22	21
30	16	45		30	22	54		30	22	13
31	17	1						31	22	5

Ianuarie.				Februarie.				March.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	21	57		1	14	16		1	3	36
2	21	46		2	13	56		2	3	13
3	21	37		3	13	36		3	2	50
4	21	27		4	13	15		4	2	26
5	21	16		5	12	55		5	2	2
6	21	5		6	12	34		6	1	38
7	20	54		7	12	13		7	1	14
8	20	42		8	11	52		8	0	51
9	20	30		9	11	31		9	0	27
10	20	17		10	11	10		10	0	3
11	20	4		11	10	48		11	0	20
12	19	52		12	10	27		12	0	44
13	19	38		13	10	5		13	1	8
14	19	24		14	9	42		14	1	31
15	19	9		15	9	20		15	1	55
16	18	54		16	8	58		16	2	18
17	18	39		17	8	36		17	2	42
18	18	24		18	8	13		18	3	6
19	18	8		19	7	51		19	3	29
20	17	52		20	7	28		20	3	52
21	17	34		21	7	5		21	4	15
22	17	17		22	6	42		22	4	39
23	17	1		23	6	19		23	5	2
24	16	45		24	5	56		24	5	24
25	16	27		25	5	33		25	5	47
26	16	8		26	5	9		26	6	10
27	15	51		27	4	46		27	6	33
28	15	32		28	4	23		28	6	55
29	15	13		29	4	0		29	7	18
30	14	54						30	7	40
31	14	35						31	8	3

South. Declination. South Declination. Sunne in the Equinoctiall North Declination.

Aprill.				May.				Iune.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	8	24	North.	1	17	56	North.	1	23	7
2	8	46		2	18	11		2	23	12
3	9	8		3	18	26		3	23	15
4	9	30		4	18	41		4	23	18
5	9	52		5	18	56		5	23	20
6	10	12		6	19	9		6	23	22
7	10	33		7	19	23		7	23	24
8	10	54		8	19	36		8	23	26
9	11	15		9	19	49		9	23	27
10	11	36		10	20	2		10	23	28
11	11	56		11	20	14		11	23	28
12	12	16		12	20	26	Solstice.	12	23	28
13	12	36		13	20	38		13	23	27
14	12	56		14	20	49		14	23	26
15	13	16		15	20	59		15	23	25
16	13	35		16	21	10		16	23	23
17	13	55		17	21	20		17	23	21
18	14	14		18	21	30		18	23	19
19	14	32		19	21	39		19	23	16
20	14	50		20	21	48		20	23	12
21	15	9		21	21	57		21	23	7
22	15	27		22	22	6		22	23	3
23	15	45		23	22	14		23	22	59
24	16	2		24	22	21		24	22	54
25	16	20		25	22	28		25	22	48
26	16	37		26	22	35		26	22	42
27	16	53		27	22	41		27	22	36
28	17	10		28	22	47		28	22	29
29	17	25		29	22	53		29	22	22
30	17	40		30	22	53		30	22	15
				31	23	4				

Declination. Declination.

Ianuarie.				Februarie.				March.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	21	57	South.	1	14	16	South Declination.	1	3	36
2	21	46		2	13	56		2	3	13
3	21	37		3	13	36		3	2	50
4	21	27		4	13	15		4	2	26
5	21	16		5	12	55		5	2	2
6	21	5		6	12	34		6	1	38
7	20	54		7	12	13		7	1	14
8	20	42		8	11	52		8	0	51
9	20	30		9	11	31		9	0	27
10	20	17		10	11	10	Sunne in the	10	0	3
11	20	4		11	10	48	Equinoctiall	11	0	20
12	19	52		12	10	27		12	0	44
13	19	38		13	10	5		13	1	8
14	19	24		14	9	42		14	1	31
15	19	9		15	9	20		15	1	55
16	18	54		16	8	58		16	2	18
17	18	39		17	8	36		17	2	42
18	18	24		18	8	13		18	3	6
19	18	8		19	7	51		19	3	29
20	17	52		20	7	28		20	3	52
21	17	34		21	7	5		21	4	15
22	17	17		22	6	42		22	4	39
23	17	1		23	6	19		23	5	2
24	16	45		24	5	56		24	5	24
25	16	27		25	5	33		25	5	47
26	16	8		26	5	9		26	6	10
27	15	51		27	4	46		27	6	33
28	15	32		28	4	23		28	6	55
29	15	13		29	4	0		29	7	18
30	14	54						30	7	40
31	14	35						31	8	3

Declination. North Declination.

April.			North. Declination.	May.			North. Solstice. Declination.	June.		
D.	G.	M.		D.	G.	M.		D.	G.	M.
1	8	24		1	17	56		1	23	7
2	8	46		2	18	11		2	23	12
3	9	8		3	18	26		3	23	15
4	9	30		4	18	41		4	23	18
5	9	52		5	18	56		5	23	20
6	10	12		6	19	9		6	23	22
7	10	33		7	19	23		7	23	24
8	10	54		8	19	36		8	23	26
9	11	15		9	19	49		9	23	27
10	11	36		10	20	2		10	23	28
11	11	56		11	20	14		11	23	28
12	12	16		12	20	26		12	23	28
13	12	36		13	20	38		13	23	27
14	12	56		14	20	49		14	23	26
15	13	16		15	20	59		15	23	25
16	13	35		16	21	10		16	23	23
17	13	55		17	21	20		17	23	21
18	14	14		18	21	30		18	23	19
19	14	32		19	21	39		19	23	16
20	14	50		20	21	48		20	23	12
21	15	9		21	21	57		21	23	7
22	15	27		22	22	6		22	23	3
23	15	45		23	22	14		23	22	59
24	16	2		24	22	21		24	22	54
25	16	20		25	22	28		25	22	48
26	16	37		26	22	35		26	22	42
27	16	53		27	22	41		27	22	36
28	17	10		28	22	47		28	22	29
29	17	25		29	22	53		29	22	22
30	17	40		30	22	53		30	22	15
				31	23	4				

	July.				August.				Septemb		
D.	G.	M.			D.	G.	M.		D	G	M
1	22	7			1	15	15		1	4	30
2	21	58			2	14	57		2	4	7
3	21	50			3	14	39		3	3	44
4	21	41			4	14	20		4	3	21
5	21	32			5	14	2		5	2	58
6	21	22			6	13	42		6	2	34
7	21	13			7	13	23		7	2	11
8	21	2			8	13	4		8	1	48
9	20	51			9	12	45		9	1	24
10	20	40			10	12	25		10	1	2
11	20	28			11	12	5		11	0	38
12	20	17			12	11	45		12	0	15
13	20	5			13	11	25		13	0	9
14	19	52			14	11	4		14	0	32
15	19	39			15	10	43		15	0	56
16	19	26			16	10	23		16	1	20
17	19	12			17	10	1		17	1	42
18	18	58			18	9	40		18	2	6
19	18	44			19	9	19		19	2	29
20	18	30			20	8	55		20	3	53
21	18	15			21	8	36		21	3	16
22	18	1			22	8	15		22	4	39
23	17	46			23	7	52		23	4	2
24	17	28			24	7	30		24	4	26
25	17	13			25	7	8		25	5	49
26	16	58			26	6	45		26	5	12
27	16	42			27	6	23		27	5	35
28	16	25			28	6	0		28	5	58
29	16	8			29	5	38		29	6	21
30	15	50			30	5	16		30	6	44
31	15	33			31	4	52				

North. Declination. North Declination. Sunne in the Equinoctiall South Declination.

October.				Nouemb.				Decemb.		
D.	G.	M.	South.	D.	G.	M.	South.	D.	G.	M.
1	7	7		1	17	30		1	23	3
2	7	29		2	17	37		2	23	7
3	7	52		3	18	3		3	23	12
4	8	14		4	18	18		4	23	16
5	8	37		5	18	34		5	23	19
6	8	59		6	18	49		6	23	21
7	9	20		7	19	4		7	23	23
8	9	42		8	19	19		8	23	25
9	10	4		9	19	33		9	23	27
10	10	26		10	19	46		10	23	28
11	10	47		11	20	0		11	23	28
12	11	9		12	20	13	Solstice.	12	23	28
13	11	30		13	20	25		13	23	27
14	11	51		14	20	47		14	23	25
15	12	12		15	20	50		15	23	24
16	12	33		16	21	1		16	23	23
17	12	53		17	21	12		17	23	21
18	13	13		18	21	23		18	23	18
19	13	33		19	21	33		19	23	15
20	13	53		20	21	43		20	23	11
21	14	13		21	21	52		21	23	6
22	14	32		22	22	1		22	23	1
23	14	50		23	22	10		23	22	56
24	15	10		24	22	18		24	22	50
25	15	28		25	22	26		25	22	44
26	15	47		26	22	33		26	22	37
27	16	5		27	22	40		27	22	30
28	16	22		28	22	47		28	22	23
29	16	40		29	22	53		29	22	15
30	17	57		30	22	58		30	22	7
31	17	14	Declination.				Declination.	31	21	58

The sixt Chapter, shewing how to take the height of the *Sunne with the crosse staffe, or with the Astrolobie, and* also how to finde the true Meridian, with other necessarie matters.

TO take the true height of the Sunne at the sea, the best way is, to do it with the Crosse staffe, for that the sea is mouable, & causeth the ship to heaue and set little or much. And also vpon the crosse staffe the degrées be larger marked then the Ring or Astrolobe: and in a large instrument, an error is séene sooner and better, then it is in a smal instrument.

How to obserue the Sun.

Now to take the height of the Sun, to know the Altitude of the Pole abone the Horizon, do this: first, set the sun with a compasse to know when he commeth nére vnto the Meridian: as soone as you sée that the sun is come vnto the South and by East, then begin to take his height with the crosse staffe, in this maner: Put the Transuersary vpon the long staffe, then set the end of the long staffe close at the corner of your eie, winking with your other eie, & remouing the transuersary forwards or backwards, til you do sée the lower end of it (being inst with the horizon) and the vpper end of it (being inst with the middle of the sun) both to agrée with the sun and the Horizon at one time: and so haue you the true height of the sun. This done, still obserue the same, vntill you sée the sun at ỹ highest, & begining to descend, then haue you finished.

To take the height of the Sunne with the crosse staffe.

But note that if you obserue with the staffe in the top of the ship, and in the mid wast, and wast of the ship, you shall find great difference; so also betwéene your obseruation on the top of a great billow, wherg the seas run whole and in the bottome betwéene two great billowes: your best place to obserue, is on the top of a great billow.

The cause why the crosse staffe is best to take the height of the Sunne vnder 50 degrees.

Yet notwithstanding this is to be noted: that it is best to take the height of the sun with the crosse staffe, when the sun is vnder fiftie degrées in height about the Horizon, for two causes. The one is this: vntill you come to 50 degrées, the degrées be largely marked vpon the crosse staffe, but after 50 degrées they be lesser marked then the other are. Againe, the sunne being vnder 50 degrées in height, you may easily take

the

the height, because you may easily see or view to the vpper ende and the nether ende of the Crosse staffe both at one time: but if it doth exceede 50. degrées, then by the meanes of casting your eye vpwards and downewards so much you may soone commit errour, and then in like manner the degrées be so small marked, that if the sunne doth passe 50. or 60. degrées in height, you must leaue the crosse staffe, and vse the Marriners Ring, called by them the Astraloby.

To take the height of the Sunne with the Astrolabie.

Now to take the height of the Sunne with the common Ring or Astrolabie, doe thus: The Sunne being (as before is declared) nére the Meridian or South, obserue it (vntill you haue the greatest height thereof) in this manner: Hold the Ring of the Astrolabie vpon one of your fingers, and turne the Alhidada vp and downe, vntill you see the shadow of the Sunne pearce or passe through both the sights thereof, being sure that the Astrolabie doth hang vpright, which you may proue in this manner.

How to correct your Astrolabie if it doth not hang vpright.

Looke at how many degrées and minutes the Alhidada doth stand vpon the Astrolabie, then turne the Alhidada vnto the same number of the degrées and minutes on the other side of the Astrolabie, and then taking the height of the sunne againe, if it doe agrée as it did before, then the Astrolabie doth hang vpright: but if it doe not, then it doth not hang vpright. For knowledge of the true height of the Sun (the Astrolabie not hanging vpright) do thus: If the Astrolaby be truly marked, marke the diuersity, that being knowne rebate from the greatest height halfe the diuersitie, or else adde vnto the lesser height halfe the diuersitie, and that shall be the true height of the Sun, although that the Astrolabie doth not hang vpright.

The Astrolabie is best to take the height of the sunne, if the sun be very high, at 60. 70. or 80. degrées: and the cause is this: The sunne comming nére vnto your Zenith, hath great power of light, for to pearce the two sights of Alhidada of the Astrolaby, & then it is not good to vse the crosse staffe, for that the sunne hurteth the eies of a man, & besides

The Astrolabie is best to take the height of the sun at 60. 70. or 80. degrees in height.

that

that it is to high to occupie the croſſe ſtaffe, (as before is declared) ſo that this way you may very much preſerue your eies. If you haue not glaſſes vpon your ſtaffe (to ſaue your eies in taking the height of the Sun) but be vnprouided of them, do thus: take and couer the ſunne with the end of the Tranſuerſary of the croſſe ſtaffe, vnto the very vpper edge or brinke of the ſun, (ſo ſhal you not need to behold the brightneſſe of it) and with the other end of the Tranſuerſarie to take the Horizon truely, and that being done, becauſe the Sunne is 30. or 31. minutes in Diameter or breadth, therefore you ſhall rebate 15. minutes from the Altitude or height of the Sunne, and then that which ſhall remaine, ſhal be the true height of the Sunne, from the Centre or middle of the Sunne. And furthermore, there is ſome errour in the taking the ſunne or ſtarre with the Ballaſtell or Croſſe ſtaffe, and that groweth by this meanes: for that the true Centre (which is the ſight of the eye) is within in the middle of the eye, and not in the outſide of the eye: ſo that the end of the long ſtaffe in the ſetting of it vnto the corner of your eie, doth ſtand ſomewhat further out then the ſight of your eye, that is to ſay that the ſight of the eie is ſomewhat further into the head, then the end of the ſtaffe doth come vnto: wherefore you muſt pare away a little of the end of the ſtaffe, for ſome mens eies more, and ſome mens eies leſſe, for that it is according as you may ſet the ſtaffe vnto the eye, for ſome men néede pare away little or nothing, and ſome men muſt pare away 14. or 15. minutes, as you may ſet the ſtaffe, becauſe ſome mens eyes be further into their head, then other ſome mens are, and the bones of ſome mens face ſtand further out then other ſome doe.

How to preſerue your eies when you touch the Sun with the croſſe ſtaffe, and haue no glaſſes.

The Diameter of the Sun is 30. or 31. minutes.

Some error in the croſſe ſtaffe and how to reforme it.

It is moreouer conuenient to know the Meridian or ſouth, which you muſt doe either with a good Compaſſe, or with a perfect Diall or Needle. but if you be on the land, this you may do, on a peece of timber or any other thing that ſtádeth ſtaſt; with a payre of compaſſes make a circle, then in the middle or center where the fot of the compaſſe did ſtand,

To get the true Meridian vpon the land.

ſet

set a wire vpright (as circumspectly as you can) and then you may doe this: loke in the morning (so it be on plaine ground, and you may se the Horizon circle, without any let at the Sunne rising, for the shadow of the wire) and there set a prick: then at the setting of the Sunne you shall set another pricke, euen at the circumference of the circle, then diuide that with your compasses euen in two peces, and strike a straight line from the wyre or center of the circle, to the middle or diuided pricke, and that shall be the true Meridian. Or else (the wyre standing vpright) sirst in the forenoone when the toppe of the wyre doth touch, or is readie to come into the circumference or edge of the circle, there make a pricke: then in the afternoone in like manner, where the shadow of the wyre toucheth the edge of the Circle, there make an other pricke euen with the end out of the shadow: this done (as circumspectly as you can) diuide these two pricks in the middle, then as is before said, draw a line from the center or wyre, to the middle pricke, and that shadow shall be your true Meridian.

After an other manner you may do this: loke and watch when the wire giueth the shortest shadow, and there make a pricke, then draw a line from that pricke to the wyre, which shall be the true Meridian.

And yet furthermore, for that it is most conuenient to know the true Meridian at the sea, because in long voiages, going farre vnto the Westward or Eastward, the compasse doth vary: to find the true Meridian, do this: Set the Sun with your compasse at her rising or appearing aboue the Horizon, and then (knowing what point and part the sunne doth rise at) set the Sunns with your Compasse at the setting or departing vnder the Horizon, & (that being knowne) you shall perfectly know whether the Compasse be varied, and how much, by the diuiding the pece of the circle contained betweene the rising and setting of the sunne into two equall parts for the right line drawne from the center of the same thorough the point of the partition expresseth the true Meridian,

To know the true Meridian at the Sea, and also if your compasse be varied, and to know how much they be varied.

Meridian, & the proportion of the circle contained betwéen the said line & the south point of your compasse sheweth ỳ quantitie of the variation. For ensample this, I do set the Sun at his rising with the compasse and he doth rise vpon the East point: in like manner also I do set the Sunne with the compasse at her setting, and do finde her to set West Northwest: so I do sée the compasse to be varied one point, that is to say, the North point doth stand North and by East, &c. And furthermore, (for that seldome times the Sun doth rise and set clére by the meanes of the clouds, and other impediments nere the Horizon) you may get the true Meridian thus: at any time in the forenoone, first set the Sunne with your compasse, and then take the true height of the Sunne.

Now you (knowing how many degrées the Sunne was high at that point of the compasse) you may in like manner obserue the Sunne in the afternoone, vntill you do finde the Sunne iust at that height that it was in the forenoone, marking at what point of the compasse the Sunne is, and so shal ye sée perfectly whether the compasse be varied or no, and also how much: for ensample thus, I take the Sun vpon the Southeast point 20. degrées aboue the Horizon, and then in the afternoone, I doe obserue the Sunne vntill such time as I doe find the Sunne iust 20. degrées aboue the Horizon againe, and then I set the Sunne with the compasse, and doe finde the Sunne to be at 20. degrées in height West southwest, so that I sée the compasse to be varied one point, that is to say, the North point doth stand North and by East, &c.

To finde the variation of the compasse in the night by the stars, but not by the Moone.

An other way also to know the true Meridian by the Sun is this: to set the Sunne with the compasse at her greatest hight aboue the Horizon, and so you shal know whether the compasse be varied, and how much: and looke what is spoken of the sunne by day, you may doe the like by night by any of the Starres that you perfectly do know, doing as you do by the Sun in all points: but you cannot doe it so well & truely by the Moone, by the meanes of the swiftnes of her motion in the Zodiacke, you may also finde the variation by the compasse

compasse the North star, as thus: set the North star with the compasse, if the North point do stand right with the star, then it is not varied, but if it doth not stand with the star, then it is varied: and that must be done when the two starres of Charles waine called the pointers, be right vnder, or right ouer the North star; but if that the stars be West from the North star, then the North starre is the third part a point vnto the Eastward of the North Pole. If the two stars of Charles waine, called the pointers, be due East from the North star, then the North star, is the third part of a point vnto the Westward of the North Pole, &c.

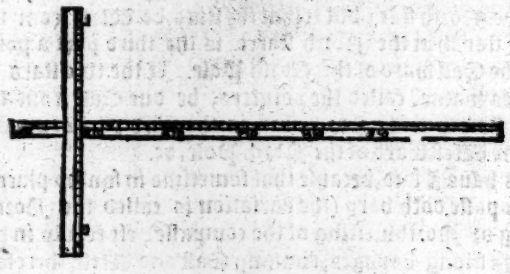
This haue I said, because that sometime in sundry places, the compasse doth vary (the variation is called the Northcasting or Northwesting of the compasse) especially in the sayling of long voyages, running East and West, therefore I would not with them to meddle with the mending of their compasse, or whetting of the side of the needle, to the end to make it stand due North, but circumspectly to awaite the altering of the compasse, and what quantitie it doth alter: as you may do very well by the order before rehearsed, and then let your compasse alone: for although that doth vary two or three points, you may make account according to the variation, as thus: I admit the Northwest point standeth due North, and my course is to go due West, I will occupie the Southwest point in this case for the West point. And thus (by obseruation and trying of my compasse) I care not what point standeth due North, for it is all one, so that you consider what point standeth North. And also there is deuised by one Norman a compasse maker, a very necessarie deuise in a compasse, that you may set the north point vpon what degree you list, according vnto the true variation of the compasse, at all times at your pleasure.

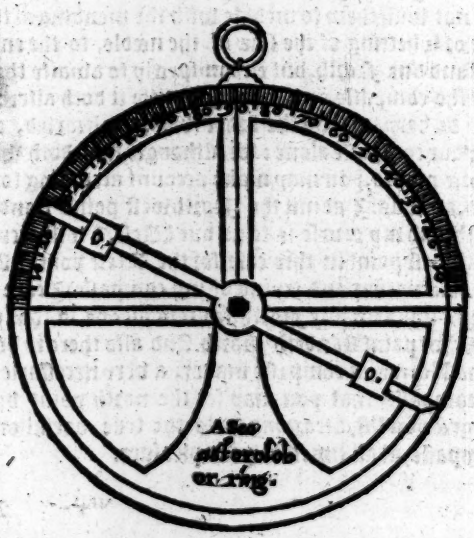
Meddle not with your compasse although it be varied.

To sayle by the compasse that is varied.

The Bella Stella, or Croſſe ſtaffe:

to take the height of the Sunne or Starre.





The vii. Chapter ſheweth how to handle the declination of the Sun, to know the Altitude of the North Pole aboue the Horizon, (the height of the Sunne being truely taken and knowen, in any place betweene the North Pole and the Equinoctiall) ſo that the Sunne be vnto the Southwards of you at the taking of the Sunne vpon the Meridian.

YOV muſt conſider by the Regiment or Table of declination (going before) that the 10. day of March in the yere 1605. the Sunne is in the Equinoctiall, entring then the firſt point of Aries (called the Equinoctiall of the ſpring-time) where he hath no declination. The 10. day of Aprill, the Sun entreth into the firſt minute of Taurus, then hauing declination to the Northwards 11. degrées 30. minuts. The 11. day of May the Sun entreth the firſt point of Gemini, hauing then declination 20. degrées 11. minutes. The 11. day of June the Sunne entreth into Cancer, where he (making his greateſt progreſſe to the Northwards) hath 23. degrées 28. minutes of declination. But now in this our time, ſome doe affirme it to be 23. degrées and a halfe, but it lacketh two minutes. The greateſt declination of the Sunne.

The 13. day of July the Sunne entreth into Leo, comming downewards to the Equinoctiall, hauing 20. degrées 8. minutes of declination. The 13. day of Auguſt, the Sun entreth into Virgo, hauing declination 11. degrées 29. minutes. The 13 of September, the Sunne entreth into Libra, (then being in the Equinoctiall and hauing no declination) which is called the Equinoctial of Autumne or harueſt, where he beginneth his South declination. The 13. of October the Sunne entreth into Scorpio, where his declination is 11. degrées 30. minutes. The 12. of November the Sun entreth into Sagittarius, his declination being 20. degrées Equinoctiall of Autumne.

12. minutes. The 12. day of December the Sunne entreth the first minute of Capricorne, where the Sunne (making the greatest progresse to the Southwards) hath of declination 23. degrées and 28. minutes. From whence he returneth to the Equinoctiall againe. The 10. of Januarie the Sunne entreth into Aquarius, where his declination is 20. degrées 12. minutes. The ninth day of Februarie the sunne entreth into the first minute of Pisces, and hath declination 11. degrées 30. minutes. The 11. day of March, the sunne returneth to the selfe same place that it departed from before: wherefore the Egyptians dio paint the yéere like to an Adder biting her taile, not hauing the vse of letters. And the Romanes called a Ring, Annulus, as it were Annus, that is to say, a yéere, because a Ring doth turne round in it selfe, as doth the yéere. The Meridian height of the sunne being known, you knowing the day of the moneth, and what yéere it is after the Bissextilis, must turne to the day of the moneth, in the Regiment or Table going before, where right against the day of the moneth you shall find the degrées of declination, and the odde minutes belonging to the degrées of declination following: that being knowne (that is to say, the Meridian height of the Sunne with the degrées and minuts of the declination) consider with your selfe whether the sun declineth from the Equinoctiall toward the Pole which is aboue the Horizon, or toward that Pole which is vnder the Horizon. If the Sunne declineth from the Equinoctiall toward that Pole which is aboue the Horizon, you must alwaies subduct the declination from the Meridian Altitude of the sunne, the remainder is the height of the Equinoctiall. The height of the Equinoctiall being subducted from 90. yéeldeth the height of the Pole aboue the Horizon. But if that the sunne declineth toward that Pole which is vnder the Horizon, you shall adde or put that declination vnto the height of the sunne, the totall summe shall shew vnto you the true height of the Equinoctiall, the which summe being taken from 90. that which doth remaine, shall be the Alti-

The greatest declination to the South.

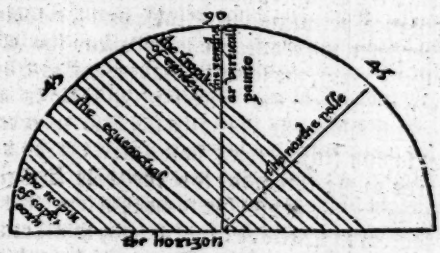
The yeere is compared vnto a Ring or Adder biting her taile.

The height of the San being taken and knowne, then how to handle the declination, to know the height of the Poles.

tude

tude of the Pole aboue the Horizon. For this is to be noted: that what height the Equinoctiall is aboue the Horizon, such is the distance betweene the Zenith or verticall point, and the Pole. In like manner, loke how many degrées and minutes are betwéne the Equinoctiall and your Zenith, so many degrées and minutes are from the Pole downe to the Horizon, and this is the cause why you must take the height of the Equinoctiall, out of 90. degrées. For your Zenith being alwaies 90. degrées from the Horizon (as you sée by this figure following) the height of the Equinoctiall being taken out of that number, leaueth the distance betwéne the Zenith, and the Equinoctiall, which is equall to the height of the Pole aboue the Horizon.

Things to be noted as touching the taking of the Altitude of the Pole.



The viii. Chapter sheweth you how to handle the declination of the Sun: when you are betweene the Equinoctiall and the Sunne: that is to say, the Sun being to the Southwards or Northwards of you, betweene the Sunne and the Equinoctiall, or vnder the Equinoctiall: the height of the Sunne being truely knowne or taken.

NOw furthermore if you be vnto the South partes néere vnto the Equinoctiall, so that the Sunne haue any great declination either to the Southwards, or to the Northwards, you being be-

tweene the Equinoctiall and the Sunne, when you haue taken the true height of the Sunne, with the Astrolabie to know the height of any of the two Poles, do this: take the declination of the Sunne for that day, with the degrées and minutes, the declination being knowen and the height of the Sunne in like manner, then adde the declination of the Sunne vnto the height thereof, and it will extend or be more then 90. degrées: then againe loke how many degrées it is more then 90. that shall be the true height of the Pole towards that side that the Sunne is: because the Equinoctiall is the number of degrées aboue 90. (which is your Zenith) to the contrarie part from the Sunne-ward. For (as I haue said in the Chapter going before, and it is generall for euer) what height soeuer the Equinoctiall is from the Horizon, that is the true distance betwéene the Zenith and the Pole: In like manner, loke what distance is betwéene the Equinoctiall and the Zenith, the same is the true distance betwéen the Horizon & the Pole, that is to say, the Pole is so many degrées in Altitude aboue the horizon. And whereas it is a common saying (in searching how farre we be vnto the Southwards or Northwards) that the Pole Arcticke is so many degrées in Altitude, or (as some will say,) that we are so many degrées in Latitude: that saying is all one in respect, although the one be called Altitude or height, and the other Latitude or wideness: for as when you say Altitude or height of the Pole, you meane the Pole is raised so many degrées aboue the horizon: so likewise when you say Latitude, you meane, you be so many degrées in wideneſſe from the Equinoctiall, for that your Zenith or verticall point is so many degrées from the Equinoctiall, as the Altitude is found to be. Moreouer, if you chance to be right vnder the Equinoctiall, as you cannot say that you haue any Latitude, so likewise cannot you say that you haue any Altitude, for that the two Poles be then iuſt with your Horizon, and in like manner the Equinoctiall palleth by your Zenith or verticall point. But when you will take the

Altitude or Latitude is all one queſtion in effect.

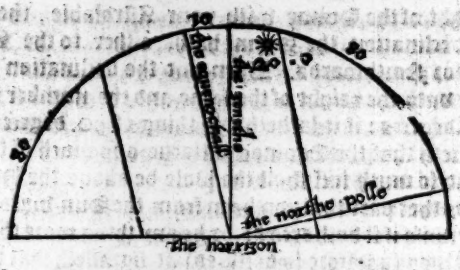
Being vnder the Equinoctiall, you haue neither Latitude nor Altitude, for that the Equinoctiall is your Zenith, and the Pole your Horizon.

the height of the Sunne with your Astrolabie, then loke what declination the Sunne hath, either to the Southwards or Northwards. Then put the declination of the Sunne vnto the height of the same, and the number will be iust 90. degrées: if it lacketh any thing of 90. degrées, then it signifieth that the Equinoctiall lacketh so much of the Zenith, and so much iust shall the Pole be aboue the Horizon, towards that part that you be in from the Sun-wards. But contrarrwise if it doth exceede, or be any thing more then 90. degrées, then (as afore is declared) it signifieth that the Equinoctiall is as much as that number (both in degrées and minutes.) On the contrarie side from the Sun-wards, that is to say, your Zenith shall be betwéene the Sunne and the Equinoctiall, and the Pole shall be so many degrées or minutes aboue the Horizon, as is the distance betwéene the Zenith and the Equinoctiall, towards that part or side that the sun is on. Wherefore I do think it necessarie to giue certaine ensamples (and first take this for an ensample.) Admit I doe take the height of the Sun vnto the Northwards 80. degrées aboue the Horizon, and the Sunne hath declination vnto the Northwards 20. degrées, to which I adde or put the height, that is to say, 80. degrées, being the height of the Sunne, and 20 degrées, being the declination of the Sunne, doe make 100 from which I pull 90. away, which is my Zenith, and so there remaineth 10. degrées. Wherefore you may conclude, that the Equinoctiall is 10. degrées to the South part of the Zenith, and the Sunne to be 10. degrées to the North part of your Zenith, so that the North Pole is 10. degrées aboue the Horizon, as by ensample it is declared.

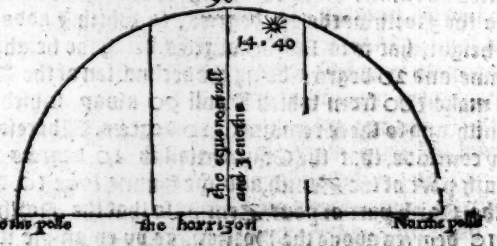
Of your Zenith being betweene Equinoctiall and the Sunne.

An ensample.

An ensample where the Pole is 10. degrees aboue the Horizon.



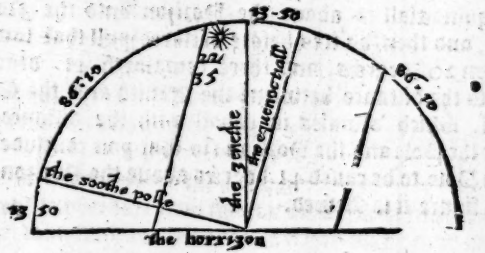
And for the second enſample, admit I take the ſunne vnto the Northwards 75. degrées, and 20. minutes aboue the Horizon, the ſunne hauing North declination 14. degrées forty minutes, I then do adde or put 14. degrées, forte minutes, vnto 75. degrées 20. minutes, and thoſe two ioyned together maketh 90 degrées, whereof you may conclude, that the Equinoctiall is your Zenith, and then the two Poles be with your Horizon, as by this example it doth appeare.



An enſample.

And now followeth to the third enſample. I admit the Sunne be taken with the Aſtrolabie 81. degrées and 15 minutes aboue the Horizon, and the ſunne hath ſouth declination 22. degrées 35. minutes, wherefore I doe adde or put together 81. degrées and 15. minutes, being the height of the ſunne, and 22. degrées, 35. minutes being the declination, and that maketh 103. degrées, 50. minutes: from which I take away

away 90. degrées which is my Zenith, so that there remaineth 13. degrées 50. minutes: so that you may safely conclude, that the Equinoctiall is 13. degrées 50. minutes, vnto the North parts of the Zenith, and then it must néeds follow, that the south Pole is 13. degrées 50. minutes aboue the Horizon, as by this ensample it is declared.



The ninth Chapter sheweth how to handle the declination of the Sunne, when you are beyond the Equinoctiall, that is to say, betweene the South Pole and the Equinoctiall: with certaine ensamples both for the South Pole and the North Pole.

AND furthermore, if you be vnto the southwards beyond the Equinoctiall, as betwéen the Tropicke of Capricorne and the South Pole, then to vse the declination of the Sun to know the height of the South Pole or Antarcticke Pole, by the height of the Sun, there is no other matter in the doing thereof, but whereas wée (being vnto the North parts) doe adde the South declination vnto the height of the Sunne, and rebate the North declination from the height of the Sunne, so in like manner the contrarie is to be vsed, that is to say, to rebate the South declination from the height of the

To take the Sunne to the Northward, you being betweene the South Pole and the Equinoctiall.

Sunne and to adde vnto the height the Sunne the North declination. As for ensample, I admit the height of the Sunne be taken 28. degrées aboue the Horizon due North, and the declination of the Sunne is 21. degrées vnto the Northwards, I doe then adde the declination of the Sunne which is 21 degrées, vnto the height of the Sunne (being 28. degrées,) which maketh 49. degrées, and so many degrées the Equinoctiall is aboue the Horizon vnto the Northwards, and then (as it is before declared) pull that summe out from 20. degrées, and there remaineth 41. degrées, which is the distance betwéne the Zenith and the Equinoctiall, which alwaies is equall with the distance betwéne the Pole and the Horizon: so that you conclude the South Pole to be raised 41. degrées aboue the Horizon. As by the figure it is shewed.

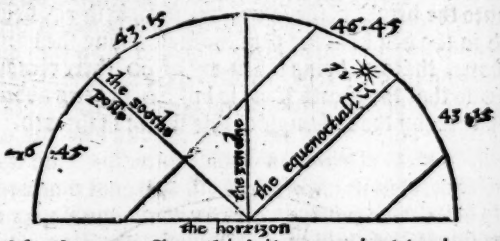
An ensample by taking the south Pole 41. degrees aboue the Horizon.



And furthermore if the Sunne hath South declination, then (as before is declared) you must substract or take away the Sunnes declination from the height of the Sunne, as for ensample. The height of the Sunne being taken at 50 degrées 30 minutes into the North parts, and the Sunne having 7. degrées & 15. minutes of declination vnto the southwards, from which height of the Sunne (for that you are vnto the Southwards beyond the Equinoctiall) you must rebate the declination, which is 7. degrées and 15. minutes, and there resteth 43. degrées 15. minutes, for the true height of the

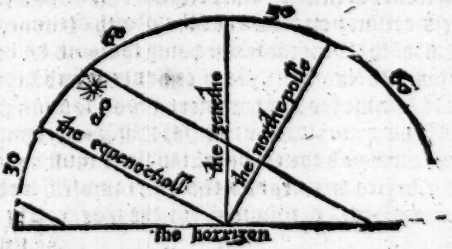
Equinoctiall

Equinoctiall, which sum you must take out of 90. degrées, that done, remaineth 46. degrées 45. minutes, the true height of the south Pole abone the Horizon, otherwise called the Antarcticke Pole, as by ensample of this figure is plainly shewed.



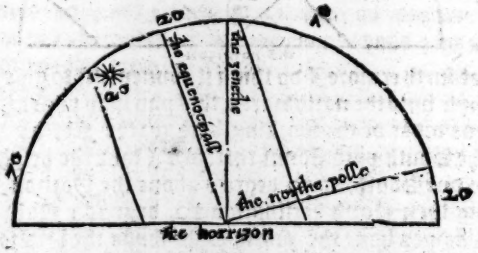
Yet furthermore I do think it conuenient to giue you an ensample vnto the northwardes, that you may perfectly know the true order of the working, both for the North part, and also the South part. Admit therefore I take the height of the sunne due South, at 50. degrées abone the Horizon, the sun hauing then North declination 20. degrées: Now (for as much as you haue the North Pole abone the Horizon) you must rebate the suns declination from the height: so that 20. degrées being taken away from 50. there resteth 30. which is the height of the Equinoctiall abone the Horizon, & that 30. being taken from 90. there resteth 60. So that you may boldly affirme the North Pole to be 60. degrées abone the Horizon, as by this figure following it is shewed.

An ensample by taking the North pole 60. degrees abone the Horizon.



In

In like manner the Sun being taken at that height and due South, having the like declination also to southwards that it had before to Northwards: that is to say, being 50. degrées in height, & having 20. degrées of declination vnto the south parts, you must adde or put the declination of the sun vnto the height of the same, and it maketh 70. degrées, which is the height of the Equinoctiall aboue the horizon: this done, that 70. being taken out of 90. there remaineth but 20. so that the North Pole is but 20. degrées aboue the Horizon, as by the ensample of this figure is shewed.



A thing to be noted in the handling of the sunnes declination.

For by the declination and the height of the sun, the true height of any of the Poles is knowne. Alwaies having this consideration, that if the North Pole be aboue the Horizon, the south declination must be added, or put to the height of the Sunne, but the North declination of the Sunne must be subducted from his height; contrariwise, if the south Pole be aboue the Horizon, you must adde the North declination vnto the height of the Sun, and take away the south declination from the height of the same. Now to know which of the two Poles be aboue the Horizon, is a very easie matter, and is knowne two waies. For first if the North Pole be aboue the Horizon, you may know it by all the starres round about the Pole, as Charles waine, and the Guards, with such other markes as be about the North Pole. Neither can you passe so sodainly beyond the Equinoctiall, but it must néedes be knowne

How to know which of the 2. Poles be vnder the Horizon.

knowne vnto you, then muſt you vſe that kind of working with the ſuns declination, that in the chapter or rule before is rehearſed: and alſo you may know it by the Arke or bearing of the ſtarres and lights round about you: for if you turne your face toward the Equator, you ſhall ſée the ſtars aſcend from your left hand toward your right, if you be on the North ſide of the world: But if you be on the ſouthſide, and turne your face towards the Equinoctiall, you ſhall ſée them riſe from the right toward the left hand. Thus much haue I ſaid as touching the ſunnes declination, becauſe I know that diuers Engliſh men would haue trauailed further beyond the Equinoctiall then they haue done, but that they haue not had the capacitie to handle the ſuns declination when they haue bin beyond the Equinoctiall, that is to ſay, vnto the ſouth parts, hauing loſt the márks aboue the north Pole, as the North Star and other: and as for the Starres of the ſouth, they haue not béene acquainted with them, but haue beaten vp and downe alongſt the coaſt of Ginny and Binney, and there haue ſpoiled and conſumed their men, through the extraordinary heate of the Sun, not knowing that in going further to the ſouth parts, they ſhould haue brought themſelues into a good temperate Climate againe.

The cauſe why Engliſh men haue not trauailed far beyond the Equinoctiall.

An vntemperate place for extreame heate.

Temperate Climate.

The tenth Chapter ſheweth how to handle the ſunnes declination vnto the Northwards where the ſun doth not ſet vnder the Horizon and alſo to take the Sunne at the loweſt being due North.

FOr further vſe of the Sunnes declination, if you haue any occaſion to trauel vnto the North wards or ſouthwards more then 67 degrées of altitude of any of the two Poles, or if the ſun haue any great declination vnto thoſe parts that you are in, then ſhall not the ſun go downe vnder the Horizon in a long time after, according as you are in diſtance more or leſſe vnto the north parts, for if you were right vnder either of the 2. Poles of the

Of being vnder either of the Poles.

the worlde, then would not the sun go vnder the Horizon half a yéer, so that there should be continually day so long. And now for the handling of the Suns declination, to know the height of the Pole, and to take the Sun North at the lowest, do this: First, with your crosse staffe, obserue the Sun at the lowest, taking the true distance betwéene the Horizon & the Sun; that being truly done, loke what declination the Sun hath: then haue you to consider that except the Sunne be néere vnto his greatest declination, that is to say, in the latter end of Gemini, (or the beginning of Cancer,) the Sunne doth decline little in 24. houres: but if the declination be very swift, you must séeke the Sunnes declination vpon the day before, & the day after, halfe the diuersity of which shall be the Sunnes declination: for that the Sun is at the angle of midnight. The Sunnes true declination being knowne, rebate his height from the declination, and so shall you haue the true content in degrées and minutes, that the Equinoctiall is vnder the Horizon due North, and then pulling that summe from 90. that which remaineth, shall be the height of the Pole aboue the Horizon: for as it is before declared, loke what height the Equinoctiall is aboue the Horizon, that is equall to the distance betwéene the Pole of the Zenith, and loke what distance is betwéen the Equinoctial and the Zenith, the same distance is betwéen the Pole & the Horizon: in like manner, loke how depe vnder the Horizon the Equinoctiall is vnto the Northwards, so high is the Equinoctiall vnto the Southwards. As for ensample, admit I were vnto the Northwards of the North cape, the Sunne being in his greatest declinatiõ vnto the Northwards, which is about the 11. day of June 23. degrées & néere a halfe: this being known I take the sunne due North at the lowest, iust fiue degrées aboue the Horizon, the declination being 23. degrées and 28. minutes. Wherefore I rebate from that, fiue degrées, and so there remaineth 17. degrées & 28. minutes, which expresseth the depth of the Equinoctiall vnder the Horizon, & then do I pull that sum from 90. & there remaineth 72. degrées 32. minutes,

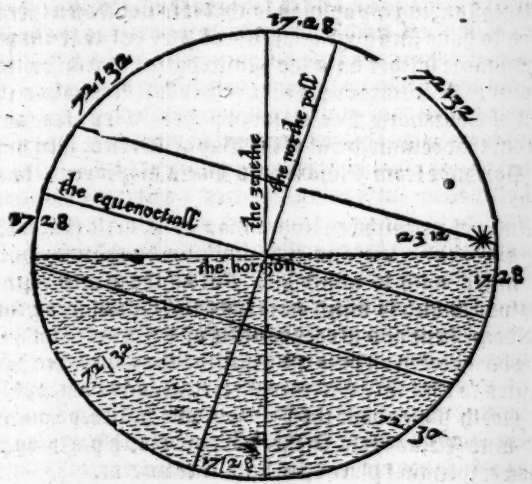
Of taking the height of the Sunne due North at the lowest.

A thing worthy to be noted, touching the Sunnes declination.

A thing to be noted of the Pole and the Equinoctiall, the Zenith, & the Horizon.

The Sun taken due North at 6. degrees.

minutes, for the true height of the North Pole aboue the Horizon, as by this ensample following is declared.



By this ensample you may also know the true height of any of the two Poles, and how to obserue the Sun at the lowest, when the Sun commeth nerest vnto the Horizon, as well as you may when the Sun is in the Meridian at the greatest height from the Horizon, which is very necessarie for them that doe occupie vnto the Northwards, as vnto Saint Nicholas in Russia, it is also very necessary for them that would attempt any voyages of discouerie to find out the passage to come vnto Cataie and China, and the Ilands of Moluccas, vnto the Northwards, as into the East, by Noua Zembla, or to the west, by that way that Captaine Forbisher, hath begun to the Northwards of Baccalaios, and Labrador, for it is to be supposed that amongst that broken lands

Of voiages for discouery to the Northwards either to the Eastward, by Noua Zembla or to

the West-ward by Cape de Paramantia.

lands and Ilands, that there may be found passage vpon the North part of America, but the great quantitie of Ise may somewhat hinder the prosperitie of that discovery, and yet notwithstanding my opinion is, that it is not frozen there so much to haue such huge quantitie of Ise, but that may be frozen more farther vnto the North parts, and so by some current or streame brought thither, and so is stayed vpon the coast of Labrador, e Baccalaios, by the meanes of the great current that commeth out of the Bay of Mexico, all alongst the Northside from Florida vnto Baccalaios, or new found land.

Additions.

And yet notwithstanding, it may be possible that if that they did discouer more vnto the northwards, that they should not meete with so much Ise. For at the North cape in Norway, which is much more vnto the Northwards, there is seldome seene any great quantitie of Ise, e yet some ships haue bin beaten off vnto the North of the cape neere 200. leagues, so that they had then neere 80 degrées of height of the North Pole aboue the Horizon, and yet they haue not met with Ise, and it is farther vnto the North parts by 17. degrées, then that place that Forbisher was at.

Wherefore if it were attempted, there is no doubt but they should find it Nauigable, eyther to the East part, or to the West part: and I am of this opinion that the thing most feared in making their discovery vnto the northwards, deserueth not so greatly to be feared as they doe make it: the cause why they are so loth to goe very far vpon the Northwards is, for that it is the frozen Zone, but my opinion is, that in Summer time it is not to be feared, but the further vnto the northwards, the more temperate warme, by meanes of the long continuance of the Sunne: for as we see by common experience, a thing once being made warme, cannot so dainely be made cold, neyther is there doubt of any great cold, vntill the Sunne be vnto the Southwards of the Equinoctiall: for I admit that a ship should saile vnto the Northward, and not stay vntill the North Pole were ele-

Of temperateesse the Pole eing raised 80. egrees.

nated

vaſed 80. degrées abone the Horizon, I doe thinke that they ſhould find it very temperate and warme, vnto the middle of September, for that by the ſpace of nine weekes together, that is to ſay, from the 10. of May, vnto the 12. of July, the Sunne ſhould come no nearer vnto the Horizon due North then 10. degrées, and 30. degrées vnto the South part abone the Horizon, and yet it is poſſible that it may be colde there vntill the end of May, for that the Sun muſt haue a time to make the ayre warme. For like as a thing once being colde, cannot be ſodainly made warme, ſo in like manner a place being once made warme, cannot be ſodainely made colde.

And furthermore, he that were in the Latitude of 80. degrées, ſhould haue but a ſhort Parallel: for the whole compaſſe of the earth and the ſea going Eaſt and Weſt, to come round about to that place againe in the ſame Parallel, is but 1250. Engliſh leagues, euery league containing three Engliſh miles: So that in ſailing of leſſe then 500. or 600. leagues, they might ſée whether it were nauigable or not. For this is one principle, that if that they doe not méete with land, then they ſhall finde ſea, to accompliſh the long deſired paſſage to finde out Cattaie. The length of the parallel. 80. degrees, is but 1250. Engliſh leagues.

The xj. Chapter doth ſhew how you ſhall know the length of the day, and to know how much the day is ſhortned or lengthned by the Suns declination.

NOw I thinke it conuenient for ſea-faring men to know the length of the day in any place that they haue occaſion to goe vnto: for that they haue occaſion to trauell into all the climates and places, tranſporting themſelues many times quickly from one place to another: and although the auncient writers haue appointed certaine climates, and other late writers in like manner haue made tables very exact for the longeſt or ſhorteſt day in any of thoſe climates and

and other places, according to the elevation of the Pole: yet haue they not opened any way vnto them, in giuing any order, for them to know when the day is an houre longer or shorter, whereby they might at all times know the length of the day, which notwithstanding is very necessarie for them, for that they be abroad vnder saile both night and day, and in like manner for that they must kéepe an account of houres and times exactly, in as much as they ought to kéepe an account of the shippes way: wherefore it must néeds be most necessary for Nauigation, to know the true time of the Sunnes rising and setting, which you shall know by this meanes: First, it is not vnknowne, that vnder the Equinoctiall the Sunne is 12. houres aboue the Horizon and 12 houres vnder the Horizon, (what declination soeuer the Sunne hath) so that there the Sun riseth at six of the clocke, and setteth at fiue of the clocke for euer.

How necessary it is for a seafaring man to know the length of the day.

Vnder the Equinoctiall, the day is alwayes 12. houres long

The Pole 16. degrees. 44. minutes, the day 13. houres long, when it is at the longest.

And where the Pole is rayled 16. degrées and 44 minutes, there the longest day is 13. houres, (the Sunne hauing his greatest declination at 23. degrées. 38. minutes) and the shortest day is 11. houres long, and then loke when the Sunne hath declined 23. degrées and a halfe either backwards or forwards, for then the day is an houre longer or shorter and proportionably: when the Sunne hath declined 11. degrées 44. minutes, then it is halfe an houre longer or shorter, &c. Moreouer where the Pole is elenated 30. degrées, 48. minutes, there the longest day is 14. houres, and the shortest day is 10 houres long, the Sunne then rising at fiue of the clocke, and setting at seuen of the clocke: and there when the Sunne hath declined 11. degrées and 44 minutes from the Equinoctiall vnto the greatest declination, then the day is an houre longer or shorter, and when the Sunne hath declined fiue degrées 52. minutes, then the day is halfe an houre longer or shorter, &c. Furthermore also where the Pole is rayled fortie one degrées 23 minutes, there the longest day is 15 houres, and the shortest, nine houres long, (the Sunne hauing his

The Pole 30. degrees 48. minutes, the longest day 14. houres long.

The Pole 41. degrees 23. minutes, the longest day 15. houres long.

his greatest declination, and as then rising at foure of the clocke 30. minutes, and setting at seauen of the clocke 30. minutes, (so that there when the Sunne hath declined seauen degrées 49. minutes from the Equinoctial, the day shall be an houre longer or shorter, and when it hath declined three degrées 54. minutes, the day shall be halfe an houre longer or shorter, &c. And furthermore, where the Pole is raised 49. degrées one minute, there the longest day is 16. houres, and the shortest eight houres long, the Sunne rising at foure of the clocke, and setting at eight of the clocke, so that there, when the Sunne hath declined fiue degrées 52. minutes from the Equinoctiall, then shall the day be an houre longer or shorter. And when the Sunne hath declined two degrées 56. minutes, then the day shall be halfe an houre longer or shorter, &c. Yet furthermore, where the Pole is raised 54. degrées 30. minutes, there the longest day is 17. houres, and the shortest seauen houres long, the Sun then rising at three of the clocke 30. minutes, and setting at 38. minutes: then when the Sunne hath declined foure degrées and 41. minutes from the Equinoctiall, to the greatest declination, the day is an houre longer or shorter, and when he hath declined two degrées 21. minutes, the day is halfe an houre longer or shorter, &c. Where also the Pole is raised 58. degrées 27. minutes, there the longest day is 18. houres long, and the shortest but six: and then when the Sunne hath declined three degrées 55. minutes from the Equinoctiall, the day shall be an houre longer or shorter: and when the Sunne hath declined two degrées lacking two minutes, then the day shall be halfe an houre longer or shorter. Furthermore also, where the Pole is raised 61. degrées 18. minutes, there the longest day is 19. houres long, and the shortest but fiue houres: then shall the Sunne rise at two of the clocke 30. minutes, and set at 39. minutes, and then when the Sunne hath declined three degrées, and 12. minutes from the Equinoctiall, then shall the day be an houre longer or shorter, &c. Furthermore, where the Pole is raised 63. degrées 22. minutes

The Pole raised 49. degrees one minute, then the longest day is 16. houres long.

The Pole raised 54. degrees 30. minutes, then the longest day is 17. houres long.

The Pole raised 58. degrees 27. minutes, the longest day is 18. houres long.

The Pole raised 61. degrees 18. minutes, the longest day is 19. houres long.

The Pole 63. degrees, one minute, the longeſt day 20 houres long.

nutes there the longeſt day is 20. houres long, and the ſhorteſt but foure houres, then ſhall the Sunne riſe at two of the clocke, and ſet at 10. of the clocke, and when the Sunne hath declined two degrées, and 56. minutes from the Equinoctial vnto the greateſt declination, then ſhall the day be an houre longer or ſhorter, &c.

The Pole raiſed 64 degrees 49. minutes the longeſt day 21. houres long.

Now where the Pole is raiſed 64. degrées 49. minutes, there the longeſt day ſhall be 21. houres long, and the ſhorteſt but three houres: and then when the Sunne hath declined but two degrées 36. minutes from the Equinoctial vnto the greateſt declination, the day ſhal be an houre longer or ſhorter. Where alſo the Pole is raiſed 65. degrées, there the longeſt day ſhall be 22. houres, and the ſhorteſt but two houres long, and when that the Sunne hath declined but two degrées and 20. minutes from the Equinoctiall, then the day ſhall be an houre longer or ſhorter. And where the Pole is raiſed 66. degrées 20. minutes, the longeſt day ſhall be 23. houres long, and the ſhorteſt but one houre long, and then when that the Sunne hath declined but two degrées, eight minutes, the day ſhall be an houre longer or ſhorter, and where that the North Pole is raiſed 66. degrées and 32. minutes, there it is 24. houres long, for that when the Sunne hath his greateſt declination vnto the Northwards, then at midnight you ſhall ſée halfe the Sunne, and when that the Sunne hath the greateſt declination vnto the South parts, then you ſhall ſée but halfe the Sunne at noone, and in going but 15. miles further vnto the Northwards, that is, but one quarter of a degrée, then the ſunne ſhall be cleane aboue the Horizon at the due North, & not ſéene at noone aboue the Horizon, the Sunne hauing his greateſt declination ſo the South, then the day ſhall be an houre longer or ſhorter, when that the Sunne hath declined one degrée 57. minutes from the Equinoctiall, and ſo forth vnto the greateſt declination. And thus much haue I ſaid as touching the length of the day, whereby you may know at all times the true length of the day in any Latitude betwéene the Equinoctiall

The Pole 65. degrees, the longeſt day 22. houres long.

The Pole 66. degrees, 20. minutes, the longeſt day 23. houres long.

The Pole 66. degrees. 32. minutes, then the Sunne ſhall not ſet vnto them.

The Sunne cleane aboue the Horizon, due North, and not to appeare aboue the Horizon, South at noon.

and

and the elevation of the Pole at 66. degrées and 32. minutes, by knowing how many degrées the Sun is declined. And that you may know on every day by the regiment going before, having this consideration, if the sunne be in the Equinoctiall having no declination, then in any Latitude the day is alwaies iust 12. houres long. And you must note this, that it is called the day from the rising of the sunne, vnto the setting of the same vnder the Horizon, and not from day light vnto day light. For before the sunne rise, and after that the sunne is set, it is counted for no parcell of the day, but it is called the day light. And furthermore, the day light will appeare by that time the sunne doth touch the 17. degrée vnder the Horizon before the sunne rising, and also the day light will not be cleane gone vntill the sunne be more than 17. degrées vnder the Horizon: as you may perceiue here with vs at London, that when the sunne hath his greatest declination vnto the Northwards in June, the day light remaineth all night. for that the sunne goeth not vnder the Horizon, but 15. degrées.

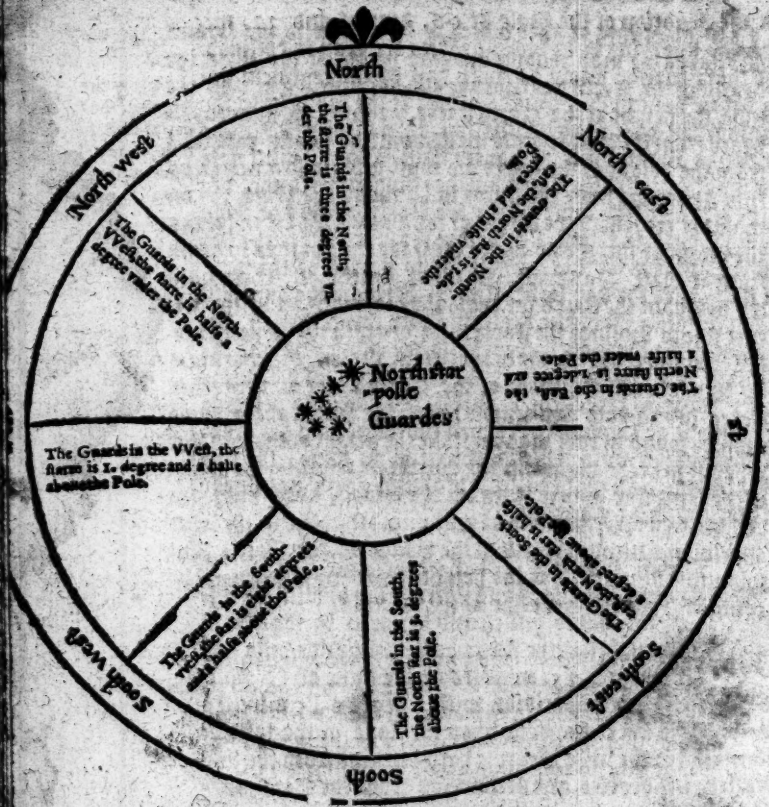
To know the length of the day at any time, in any place: what the day is.

The xij. Chapter is of the North starre.

AS touching the North starre, I say but little thereof, for that is sufficiently declared in the Art of Nauigation, the starre hath Longitude vnto the 21. degrée, 35. minutes of the signe of Gemini, and commeth to the Meridian with 3. degrées 45. minutes of Aries. This starre standeth vpon the tippe of the taile of Vrsa minor, or the little Beare, & hath latitude from the line Ecliptick 66. degrées, and declination from the Equinoctiall 86. degrées 30. minutes, so that it is distant from the Pole three degrées and 30 minutes. Here note that some of late time making obseruation, affirme that the Pole starre is but two degrées 52. minutes from the Pole.

The North starres declination.

Here followeth the note by the Guards, to know whether the North starre be aboue the Pole or vnder the Pole, and how many degrées and minutes, &c.


North
North east
East
South east
South
South west
North west
Northstar
polle
Guardes
The Guards in the North, the ſtarre is three degrees vnder the Pole.
The Guards in the North, VVeſtvvhile ſtarre is halfe a degree vnder the Pole.
The Guards in the VVeſt, the ſtarre is 1. degree and a halfe aboue the Pole.
The Guards in the South, the North ſtar is 3. degrees aboue the Pole.
The Guards in the South, VVeſtvvhile ſtar is eight degrees and a halfe aboue the Pole.
The Guards in the South, Eaſtvvhile ſtar is halfe a degree aboue the Pole.
The Guards in the East, the North ſtarre is 1. degree and a halfe vnder the Pole.
The Guards in the North, Eaſtvvhile ſtarre is 1. degree and a halfe vnder the Pole.

By obſeruing of that which is ſet downe in the former figure we may readily finde the height of the Pole, the height of the North ſtarre being alſo knowne. For if in taking the height of the North ſtarre, we finde the guardes to beare from it Weſt South weſt, South or South eaſt, then from the height of the ſtarre we muſt ſubduct ſo much as by this figure we finde the ſtarre to be aboue the Pole, the remainder expreſſeth the height of the Pole. But if in taking the height of the North ſtarre we finde the guardes to beare from it Eaſt, Northeaſt, North or Northweſt, then vnto the height of the ſtarre we muſt adde ſo much, as by the former figure we finde the ſtarre to be beneath the Pole, the totall ſumme expreſſeth the height of the Pole. Furthermore by two ſeuerall Altitudes of the North ſtarre or any other ſtarre which doth neuer ariſe or ſet, the height of the Pole may be found in this manner: take the height of the ſaid ſtar when it is at the higheſt in the Meridian, take alſo the height of the ſame ſtar when it is at the loweſt, adde both the heights together, the halfe of that number added to the leſſer Meridian Altitude expreſſeth the height of the Pole: But this muſt be noted, that the heights ſeuerally taken, muſt be counted from the ſame ſide of the Horizon.

The 13. Chapter doth ſhew you by the ſayling vpon the quarter of your compaſſe, in how farre ſayling you do raiſe a degree, and what you do depart from the Meridian, and in the end there is a demonſtration thereof: reckoning it as you do ſaile vpon a flat, but not Spherall.

Furthermore, becauſe there be ſome that deſire to know the alteratiõ of a point. to this end, that in running vpon any point, they may know how much they raiſe or lay the pole ſooner vpon one point then vpon an other, I haue therefore thought good to ſet the matter downe briefely in this Chapter: in going to the North, you doe raiſe the Pole, & lay the Equinoctiall: contrariwiſe, going towards the South you

In going Southwards you raiſe the Equinoctiall & lay the Pole.

you lay the Pole, and raise the Equinoctiall. But in sayling or going East or West, you doe neither alter your Pole nor Parallel, but only your Meridian. Whereas in sayling vpon any other point saving South and North you do alter both your Pole and Parallel, and also your Meridian. Wherefore I will open vnto you (in sayling vpon one of the quarters of the compasse) what distance vpon euery point doth raise or lay one degrée, and how many miles you are distant from the Meridian of that place from whence you departed. But here is one thing to be noted (as I suppose) in the most part of Cards they allow for euery degrée but 17. leagues and a halfe. Your Cards be most commonly made in Lisbborne, in Portugal, in Spaine, or else in Fraunce. But as I take it, we in England would allow 60 miles to one degrée, that is, after 3. miles to one of our English leagues, wherefore 20. of our English leagues should answere to one degrée, for that 3. of our miles will not make one of their leagues, and because they make their accounts by their leagues in the Cards, and not by ours, therefore I will shew you by our English miles. An English mile containeth a thousand pases, and euery pase 5. foote, and euery foote 12. ynches. Now some thinke that a pase cannot be 5. foote, but a pase Geometricall is two reasonable steppes, for if cannot be a pase, vntill the hinder foote be removed forwards, and those two steppes will containe fiue foote, and so may any man endure to goe at pleasure. But now to our purpose. For the sailing of one quarter of the compasse this is to be noted. First, that in sayling directly South or North, you doe raise or lay the Pole a degrée in three score miles going. In the altering of one point from the South or North in three score and one miles: and you be departed from the line of the North and South, or the Meridian 12. miles. In altering of the second point, you raise a degrée in sailing three score and fiue miles: and depart from your Meridian 25. miles. In altering of the third point, you do raise or lay one degrée in sailing three score and 12. miles, and a 9 part: and are departed from your

In going to the Northwards raise the Pole and lay the Equinoctiall

Of English leagues & Spanish leagues.

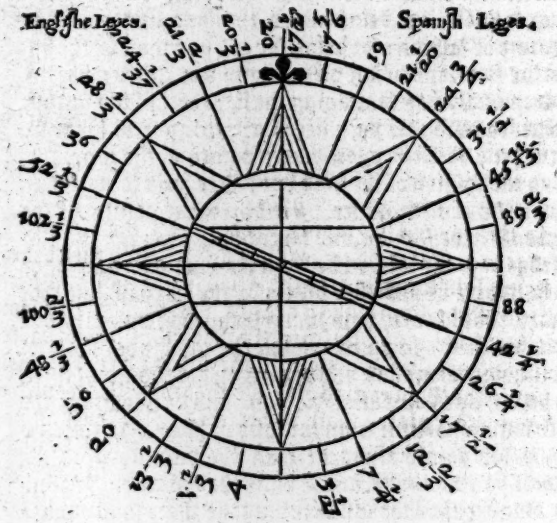
A degree is 60. miles, or twentie English leagues.

your Meridian 40. miles. Moreouer, in altering of the fourth point, you doe raise or lay a degrée in the going of foure-score and fiue miles: and depart from your Meridian three-score miles. In altering of the fift point or winde, you raise a degrée in the sayling of 108. miles: and depart from your Meridian foure-score and ten miles. In sayling by the sixt point, you raise or lay one degrée in 157. miles: and depart from your Meridian line 145. miles. Last of all, in sayling by the seauenth point or winde you do raise a degrée in going of 308. miles: and depart from your Meridian line 302. miles: and after this manner you may consider of the other three quarters of the Compasse. But if you require to know the rayling or laying a degrée by the leagues of the Cards: that is, at 17. leagues and a halfe: then behold the figure following, or read the Art of Nauigation, and there shall you finde how many degrées you be departed from your Meridian, and also from the place that you departed from: and yet that serueth for none other place but onely for vnder the Equinoctiall, for hée that maketh account of it in any other place, shall be deceiued: For euer as you goe to any of the two Poles, your degrées still be shorter and shorter, till such time as your Meridian méeteth vnder the Poles, whereof I intreate in the sixteenth Chapter.

A note to know in how farre sayling you do raise or lay a degree in the sayling by any one point of the compasse.

For the better vnderstanding of the things aforesaid, looke on this figure following. In the which figure you are to note this, that the numbers which are set vpon the vppermost quarter of the circle towards the left hand, expresse the English league which wée must runne vpon each seuerall point of the Compasse before we can raise or let fall the Pole a degrée. The other number on the right hand are the Spanish Leagues serving to the same purpose. The numbers set on the neather most quarter of the circle towards the left hand expresse the distance in English leagues from the Meridian, when we haue raised, or let the Pole fall a degrée,

but those on the right hand are the Spanish Leagues expressing the same distance.



The 14. Chapter teacheth to know how farre any land is off from you, knowing but the distance betweene any two places: whether you runne along by the land, or directly to the shore, or otherwise, with other necessarie things.

FOr that I know it very necessarie and profitable for Sea-men to know how neere or farre they be into the Sea, and how neere to the land, I will intreate thereof for diuers considerations. And first, because in

in running alongſt the land there may be danger, becauſe it may be ſuch a certaine quantitie into the ſea, that they may go both within and without it. And alſo in like maner, being at one diſtance from the land, the land may riſe in ſuch a ſhape or faſhion, but being nérer, the land may riſe in an other forme or faſhion; for being far off, you ſhall ſée the hils within the land, and being nére, the hils or cliffes nére vnto the Sea coaſt, may take away the ſight of the land within.

A note for the land, riſing in diuers ſhapes or faſhions.

Furthermore alſo it is very neceſſary, to know in what faſhion the land doth riſe vpon diuers points of the compaſſe, as oft as the faſhion of the land doth alter, and to note it in ſome booke for remembrance. Firſt by what points of the compaſſe, then the faſhion, and laſt, at how farre off &c. For knowledge how far off you be from the land, you may haue this help, if there be any two places by the ſea coaſt, whereof you know the diſtance, how many leagues or miles the one is from the other. In going alongſt the coaſt you ſhall ſet them with your compaſſe, and when you are thwart of them if they be but one point aſunder, you ſhall be fiue times the diſtance betwéene them from the land or ſhore. If the two places be two points aſunder, then the diſtance vnto the ſhore ſhall be two times and a halfe the diſtance. If three points aſunder, then the diſtance vnto the ſhore ſhall be once the diſtance and a halfe. If foure points aſunder, the ſame diſtance ſhall be betwéen you & the ſhore, that is betwéene the two marks. If fiue points aſunder, then is it vnto the ſhore but two third parts of the diſtance betwéene the two places. If ſixe points aſunder, (you being thwart of one of them) then ſhall the diſtance vnto the ſhore be, not halfe the diſtance betwéene the two places. And in all theſe caſes before rehearſed the one place muſt be thwart of you, the other muſt be a head or ſtearne of you: and ſo it is exact and true. As for enſample this: I going alongſt by ſome coaſt, do know before hand one place to beare from another Eaſt and Weſt: beſides this alſo I know the diſtance to be three leagues aſunder. When I haue brought one of the places South or

To know how far the land is from you where two lands be but one point aſunder.

North

Of two places to be one point asunder.

North of me I doe set them with my compasse, the one being North of me, and the other bearing North by East, that is one point asunder: Now the distance vnto the shore being fiue times the distance betweene the two places which be three leagues asunder, I know the shore to be 15. leagues from me, which (if the places were but one league asunder) should be but fiue leagues from the shore.

To be two points asunder

Furthermore, if the places be two points asunder, that is to say, the one North, and the other North Northeast, then shall the distance vnto the shore be seuen leagues and a halfe from mée. Whereas if the two places were but a league asunder, it should be but two leagues & a halfe vnto the shore.

Three points asunder.

And furthermore, if the places be three points asunder, that is to say, the one North, & the other Northeast and by North, the distance vnto the shore shal be foure leagues and a halfe: whereas if the two places were but one league asunder vnto the shore it should be but a league and a half.

Foure points asunder.

If foure points asunder, that is to say, if the one place be due North and the other place northeast, then is it vnto the shore three leagues iust.

Fiue points asunder.

If but one league asunder, then but one league vnto the shore. Moreouer if the two places be fiue points asunder, that is to say, the one North, and the other Northeast and by East, then the distance vnto the shore shall be but two leagues: whereas if the two places were but one league asunder, vnto the shore should be but two miles. Last of all if the two places be sixe points asunder, that is to say, the one North, and the other East Northeast, then it shall not be a leagne & a halfe vnto the shore, &c.

Sixe points asunder.

But if you come directly to the landwards, hauing no cause to be thwart of none of those knowne places then to know how far you be from the land, you must do as is by the places before spoken of. For if you goe due North, the one place being North and by West, and the other North & by East, then (the two places being three leagues asunder) you shall be seuen leagues and a halfe from the shore: so that if you run into the shore due North, vntill they be foure points asunder, that is to say, the one North

Of going or sayling into the shore.

Northwest,

Northwest, and the other North Northeast, then it shall be vnto the shore three leagues, and three quarters.

And furthermore you still running in due North till the two places be sixe points asunder, that is to say, the one place to be Northwest and by North, and the other place to be Northeast and by North, the distance vnto the shore shall be two leagues and a quarter. And againe, if you runne in due North vntill they be eight points asunder, that is to say, the one place Northwest, and the other Northeast: then the distance vnto the land or shore, shall be but halfe the distance betweene the two places, that is, but one league and a halfe. Lastly, if you runne to the land due North, vntill the two places bee 10. points asunder, that is to say, the one place Northwest and by West, and the other Northeast and by East, then the distance vnto the shore shall be but one third part of the distance betweene the two places, that is, but one league from the land, &c. Thus much haue I said as touching the bearing off the land from you, by the points of the Compasse, to know the distance or how farre the land is off: which is very necessarie for Sea-men to know, for diuers considerations, as I said before.

A way to know how one head-land beareth off another.

If now therefore you know not how one head-land doth beare from another, do thus: in running alongst the coast, when you see the appearing of any land one before another, set them with your compasses, and loke how they beare from you, by what point of the compasse, and so shall you know iustly how the one land doth beare or lie from the other. And by this order you may correct your plats, by doing this, as often as you see two notable places together: As Islands rocks head-lands mouthes of hauen, sands, or whatsoeuer else be worthy of noting: this done, as often as you doe see them together, set them with your compasse and that will shew you most certainely, that so they do beare the one from the other.

To know the distance at sea.

You may know the distance in like maner betwéen them, if you know your ships way, as thus, when you first see any

two

betweene any two head-lands.

two places together as two head-lands, or two Ilands, hauing set them with your compasse, & knowing how the one beareth from the other, then for that you will not come nèr vnto them, you do hale off from the land vntill that you haue brought your selfe farre inough off, at your discreation, and when you be thwart of the first head-land, set the other land, and consider how it beareth from you: then recken your ships way, how many leagues the ship might go, vntill you come thwart of the other head-land keping your course along as the two head-lands beare, and so shall you both know the distance betwéene the two places, and also how far you be off from them. In like manner, hauing consideration of the distance betwéene the other places that you haue obserued, both by your compasse, and also the shippes way, you may know how farre it is to the shore, going right to the land-wards, by your crosse staffe, although you know not the distance betwéene any two places.

To know how farre it is vnto the land another way.

And thus: take the wideneſſe betwéene any two places with your crosse staffe, bearing right to land-wards, and then remoue the crosse staffe or Transuersarie, halfe the length of the Transuersarie, that is to say, the end next vnto you, and then by running in, till the two ends of the Transuersarie do agrée with the two markes, you shall be halfe way to the shore: then loke how farre the ship hath gone in that time, for the same distance is vnto the land from the ship. But if you remoue the Transuersarie but a quarter the length thereof to you wards, then at the place where the end of the Transuersarie doth agrée with the two markes, shall be one quarter of the distance betwéene the shore and you at the first obseruation: and it shall be thrée times the quantitie vnto the shore &c.

To know the ships way.

As I doe farther shew the conclusion of the crosse staffe in my bookes called, the Treasure of Trauailers, the first booke the 10. 11. 12. 13. and 14. Chapters. And to know the shippes way, some doe vse this, which (as I take it) is very good: they haue a péece of wood, and a line to vere out ouer bord,

boyd, of a great length, which they make fast at one end, and at the other end, and in the middle, they haue a peece of a line, which they make fast with a smal thread to stand like vnto a crowsfoot: for this purpose, that it should driue a stearne as fast as the ship doth goe away from it, alwaies hauing the line so readie that it goeth out so fast as the ship goeth.

In like manner they haue either an houre glasse of a minute, or else a knowne part of an houre, by some number of words, or such other like, so that the line being vered out, may be stopt iust with the time that the glasse is out, or the number of words spoken, which done, they hale in the logge or peece of wood againe, and take how many fadome the ship hath gone in that time: that being knowne what part of a league soeuer it be, they multiply the number of fadames, by the portion of time or part of an houre. Whereby you may know iustly how many leagues and parts of a league the ship goeth in an houre, &c. As for example this: hauing a minute glasse (but it is better for to haue a portion of time by some number of words, and the lesser part of time that you haue, it is the better, for if that the ship doth go very fast, you shall haue too much line out, and if that the shippe doth goe but slowly, then you may double the length of time by speaking the words twice or thrice ouer) let downe your logge handsomely into the water, and then let the line be marked accordingly vnto the ship, a two or three fadame from the log accordingly, that it be so farre a stearne that it commeth into quicke water that the edie of the stearne doth not stay it; that being done, then begin to turne your glasse, or to speak your words, and stay it iust at the end of the words, and then hale in your log againe, and measure how many foote or fadams that you haue vered or put out in that time, and suppose that your portion of time is 120 parts of an houre, more or lesse it maketh no matter, so that you doe know the iust portion of time.

An English league is 2500. fadame.

A Spanish league is 2857. fadame.

Additions.

And suppose that you haue vered 25. fadams in the 120. parts of an houre, therefore multiplie 120. by 25. and of that multiplication

Addition.

multiplication there commeth 3000. fadame, and now an English league is 2500. fadame, so that the Ship hath gone one league and 500. fadames in an houre, and the said 500. fadams is the fift part of a league, so that the ship hath gone one league and one fift part of a league in an houre. And this by multiplying the portion of time by the number of fadams you may keepe a verie good reckoning of your ships way, hauing this consideration, that you doe make as oftentimes prowse as the winde doth increase or decrease.

And for a good order in the keeping your account, do this: Looke how long time that the winde hath blowne stedely without any increasing or decreasing, or altering of your course, then when that you doe see what or how many fadames that the ship hath gone in an houre, multiply the said number of fadames by so many houres as the ship hath gone by the said winde, and then diuide all that sum by 2500, or else it is better to adde al your number of fadams as long as the ship hath gone one course without altering: as for ensample this. The ship hath gone foure houres 25. fadame, in the time of 120. part of an houre, that is in 4. houres 12000. fadame, and the wind encreasing, she went three houres 34. fadames. In 120. part of an houre, that is in 3. houres 12240. fadames, and the wind decreasing the Ship went fiue houres, but 16. fadames, in the 120. part of an houre, that is 9600. fadame in fiue houres, now adde all these numbers of fadames together, that is, 12000. and 12240. and 9600. and all these make 33840. So that the ship hath gone 12. houres 33840. fadames, and now diuide this sum by 2500. which is a league, and then there will stand 13. in the quotient, & 1340. remaineth ouer. So that you may conclude, that the ship hath gone 13. leagues and a halfe, and 90. fadames: and by this meanes you may kéep a very good order in your reckoning, and so note it in your booke, and make a marke in your Carte, &c. And this is to be noted, that a Spanish or Portugall league doth containe 2857. fadames, and an English league but 2500. fadames.

The

The xv. Chapter or Rule, teacheth of the Longitude, &c.

NOw some there be that be very inquisitiue to haue a way to get the Longitude, but that is to tedious for Seamen, for that it requireth the deepe knowledge of Astronomie. For this they must consider, that the whole frame of the Firmament is carried round from the East to the West in 24. houres, so as there remaineth neyther light nor mark, but goeth round, sauing onely the two Poles of the world, & these two stand alwayes fast. But as I said before in the 9. rule, of him that going South or North, doth raise or lay the Pole, and in like case the Equinoctial altering his Parallel, and causing the light of the Firmament to alter the time of their shining or abiding aboue our Horizon: so he that goeth directly East or West, doth neither raise nor lay the Pole, so that still the lights of the firmament doe make one manner of Arch, according to their Latitude or declination: but the going East or West doth alter the Meridian, causing the Planets to haue their aspects at another houre or time, altering the time of the Eclipses: which is necessary for all trauailers by sea, or by land to know. Therefore I thought it needfull to be spoken of: for as Countries haue Latitude from the pole, so in like maner they haue an appointed Longitude: you may get the Latitude with Instruments, but the Longitude you must bring from another place, which you cannot do but with a Globe, or else a Map or Card, and then you must measure from the meridian of the Canary Ilands, otherwise called the fortunate Ilands. And in our Latitude of London, euery 555. miles, which containeth 15. degrées, will answere to one houre of time: and vnder the Equinoctiall 900. miles, to 15. degrées: the degrées of Longitude vnder the equinoctial be as long as the degrées of Latitude,

Altering the time of rising and setting of the lights.

Altering the aspects.

Of Latitude and Longitude.

15. degrees is an houre of time, and at London it is 555. miles.

but

but towards the Pole they are lesser and lesser, they come to nothing under the two Poles: with vs at London 57. miles will answere to one degrée of Latitude, the Pole being raised betweene 51. and 52. degrées. The cause why the Longitude was fetched from the Canarie Ilands I know not, but it was as I suppose, because it was the westermost place then knowne: for Ptolomeus was the first that ordained that rule.

Longitude beginneth at the Canary Ilands.

Now furthermore, because you shall know this the better, I haue set forth in my second booke, called the Treasure for trauailers, certaine principal places in the whole world, both according to their Longitude & Latitude, whereby you may know what manner of Arch the Sun with the other lights doth make, & also by the Longitude, you may know at what time the Moone doth make any aspect with any of the Planets. Besides this, you may know the Eclipses of the Sun or Moone, with the change, quarters, and full Moone, in all places at the very true houre and minute of time of the Diameter. If you haue a true, and an exact Ephemerides, and consider diligently for what Longitude or place your Ephemerides was made. The Longitude may be found at the time of the Eclipses of the Moone, so that she be aboue your Horizon in any place vpon the superficies of the earth, or sea in this manner.

To know the true time of the aspects of the Moone.

Séeke out in the Ephemerides, the time of the Eclipse, obserue also diligently the iust time, wherein you sée the Moone Eclipsed, compare the said time with the time set downe in the Ephemerides, if they doe both agrée, then are you in the same Longitude, and vnder the Meridian of that same place for the which your Ephemerides was made. But if the two times compared together do differ, then are you either to the East or Westward of that place, for the which your Ephemerides was made. If the time wherein you obserued the Eclipse be lesser then that which is set downe in the Ephemerides; then are you to the Westward, but if it be greater, then are you to the Eastward of that place,

place, for which your Ephemerides was made. How much you are to the East or Westward may easily be knowne by the difference of time and the degrées of Longitude answerable thereunto. Unto every houre there are ascribed 15. degrées, to every halfe houre seuen degrées and a halfe, and so consequently following that rate as the difference of time is more or lesse. If the time noted in the Ephemerides doth differ an houre from the time of your obseruation, then doth the place wherein you obserued the Eclipse differ in Longitude from the place, for the which the Ephemerides was made, 15. degrées: if two houres, then is the difference of Longitude 30. degrées, &c. These degrées answerable to the difference of time, and expressing the difference of Longitude must be subducted if your obseruation of the Eclipse were made to the westward, otherwise they must be added to the longitude of the place, for the which the Ephemerides was made, so shall you finde the true Longitude of the place in the which your obseruation was made.

And furthermore you might know your Longitude with the Ephemerides, by the coniunction of the Moone with other fixed starres, if it were not for one great infirmitie, and that is the paralley of the Moone, which the semi-diameter of the earth doth cause, by nearenes of the moone vnto the earth: wherefore I would not haue any man thinke that the Longitude is to be found at Sea by instrument. Therefore let no Sea-men trouble themselues with any such rule, but (according to their accustomed manner) let them kéepe a perfect account and reckening of the way of their ship, whether the ship goeth to léewards, or maketh her way good, considering alwaies what things be against them or with them, as tides, currents, winds, or such like.

The Longitude is not to be gotten with instruments on the Sea.

The xvi. Chapter sheweth how many miles will answere to one degree of Longitude, in euery seuerall Latitude, betweene the Equinoctiall and any of the two Poles: with the demonstration for that purpose, and the diuersitie of aspects of the Moone.

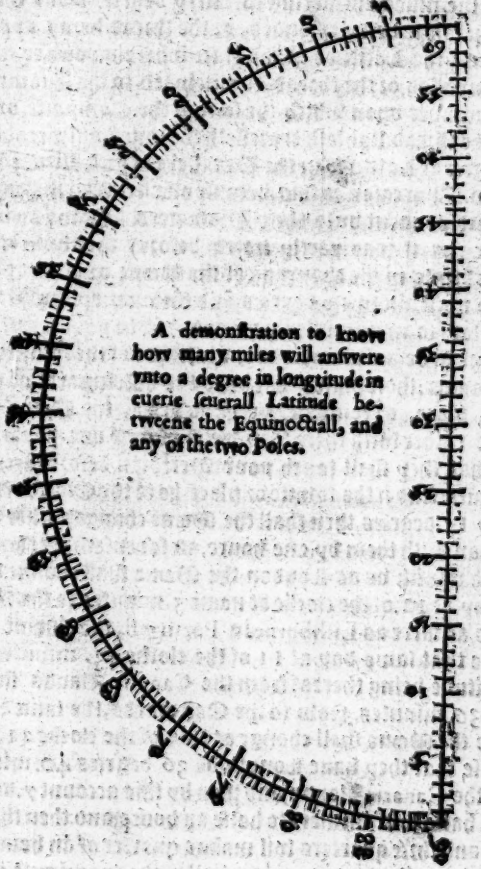
NOw by this rule shall I teach you how many miles will answere to one degrée, for euery seuerall Latitude, betwéne the Equinoctiall and any of the two Poles, either Arcticke or Antarcticke. And first vnder the Equinoctiall, (the two Poles being euen with the Horizon) 60. miles doe answere to one degrée, as I said in the 15. Chapter.

And now shall follow the rest. Where the Poles be raised 21. degrées 56. miles belongeth to one degrée of Longitude. Now the Poles being raised 29. degrées 52. miles doe answere to one degrée. The Pole being raised 36. degrées 48. miles doe answere to one degrée.

The Pole 42. degrées raised 44. miles goeth to one degrée of Longitude. The Pole raised 48. degrées 40. miles to one degrée. The Pole raised 53. degrées 36. miles to one degrée. The Pole raised 57. degrées 32. miles to one degrée. The Pole raised 62. degrées 28. miles to one degrée. The Pole raised 66. degrées 24. miles to one degrée. The Pole raised 70. degrées 20. miles to one degrée. The Pole raised 74. degrées 16. miles to one degrée. The Pole raised 78. degrées 12. miles to one degrée. The Pole raised 82. degrées 8. miles to one degrée. The Pole raised 86. degrées 4. miles to one degrée. The Pole being raised to the highest at 90. degrées (being then your Zenith) there all the Meridians méete. And now shal follow a demonstration of halfe a circle, and that shall shew you how many miles wil make a degrée, according vnto euery latitude that you are in, by the applying of the one foote of a paire of Compasses, or by making a

thread

thread fall to the lower corner of the halfe circle at 90. and by extending of the other foote of the Compaſſe, or by laying



A demonſtration to know how many miles will anſwere vnto a degree in longitude in euerie ſeuerall Latitude betweene the Equinoctiall, and any of the two Poles.

the thread vpon the latitude of the place wherein you are, the which Latitude or elevation of the Pole is marked by seuerall degrées in the halfe circle, and in the Diameter are marked the miles answering to euery degrée. Your Compasses therefore being extended, or the thread being applied from 90. to the Latitude of the place wherein you are, turne the Compasses or the thread downeward to the Diameter, for the number vpon which the foote of the Compasse, or the end of the thread lighteth, expresseth the miles answerable to each degrée of Latitude in the Parallel of the Latitude propounded. The reason is this, because all circles be in proportion correspondent vnto their Diameters. Now you must consider (as it was partly noted before) that vnto euery houre of time in the changing of the Moone, or of the Eclipses, you must allow 15. degrées, and vnto euery degrée you must allow so many miles as you doe see in your former instrument to be answerable to the latitude of the countrie, in this manner: those places that be to the Westward of your towne, place, or countrie, by 15. degrées, the Moone shall change rather with them then with you by one houre, because that they shall touch your Meridian before theirs by one houre. And if the towne or place be to the Eastwards of you by 15. degrées, then shall the Moone change rather with you than with them by one houre, as for ensample thus. If so be that with vs as London the Moone shall change vpon any day at 12. of the clocke at noone 5. minutes to the Westwards as farre as Lisshborne in Portugall, the Moone shall change that same day at 11. of the clocke 43. minutes, the Longitude being thereof from the Canarie Ilands fiue degrées 36. minutes. Now to the Eastwards, the same day at Rome the Moone shall change at two of the clocke 31. min. because that they haue Longitude 36. degrées 40. minutes from the Canarie Ilands, and then by this account 7. degrées and a halfe will answere to halfe an houre, and then three degrées and three quarters will make a quarter of an houre, and then nine miles and a quarter will make one minute of time

15. Degrees answereth vnto an houre of time.

with

with vs at London in our latitude, so by this rule you may know at what time and minute the Eclipses or changes of the Moone doe happen, knowing for what place your Almanacke was made, as commonly we here in England doe make them for the Citie of London.

Thus much haue I said as touching the true time of the change of the Moone, for that some people (as I haue said before in the third Chapter) do contemptuously say, why do they not giue or make rules for ever, to know the houre and minute of the change, full and quarters of the Moone? And yet they be vtterly voide of any knowledge in the Mathematicall science, whereby they might know the true time of the change of the Moone: For it is a question Astronomicall, to know the Moones motion: a question Geometricall, to know the true time of the aspects, or measure betweene the Sunne and the Moone: and thirdly, it is a question Cosmographicall, to know the true Longitude of the place hee is in, at the time when the Moone changeth, &c. To know the true time of the change and quarters of the moone, is a question Astronomicall, Geometricall, and Cosmographicall.

Now followeth the next rule which shall treate of Longitude and Latitude.

The seuenteenth Chapter sheweth the Circumference of the whole Earth and the Sea, vnder sundrie Parallels, whereby any Sea-man may know what quantitie or part of the earth that he hath sailed, or passed, by the number of leagues, and also he may know the alteration of time, &c.

AND now furthermore I doe thinke it necessarie for to shew the Circumference of the whole earth, in sundrie Latitudes from the Equinoctiall, whereby in sayling, you may know what quantitie or part of the whole earth you haue passed or gone, and also what the diuersitie, aspect, or time Additions.

is wherein you haue transpoꝛted your selfe from a place assigned, which is necessarie foꝛ them that should goe any long voyage.

Under the Equinoctiall the whole earth is in circumference 7200. leagues, attributing 20. leagues to a degrée, and the halfe thereof is 3600. leagues. In that Parallel it is midnight to one, when it is high noone to another, and the quarter of a Compasse is 1800. leagues, and there the diuersitie of time is altered fiue houres, and then in 900. leagues the time is altered thꝛée houres: so that in the sayling East oꝛ West vnder the Equinoctiall thꝛée hundꝛed leagues, shall alter one houre of time in the Eclipses oꝛ the changes of the Moone, &c.

Furthermoꝛe, where the Pole is raised 20. degrées aboue the Horizon round about the earth, keeping the Parallel, the whole compasse is 6766. leagues, and the halfe of it is 3383 leagues, and there your noone is mid-night, and then a quarter of that Parallel is 1691. leagues and a halfe, and there the alteration of time is fiue houres, and then 846. leagues doth alter thꝛée houres of time, so that 282. leagues doth alter one houre, in the change oꝛ Eclipses of the Moone, &c.

In the Latitude of 30. degrées from the Equinoctiall, the compasse of the earth vnder that Parallel is 6236. leagues, and the opposite part in that Parallel is 3118. leagues, and there noone is mid-night, and then the quarter of the compasse of the earth is 1559 leagues, and then passing in that Parallel 779. leagues and a halfe, doth alter thꝛée houres of time: so that 260. wanting ⅓ leagues, shall alter one houre in the aspects of the moone, and also in the Latitude of 40. degrées from the Equinoctiall, the whole compasse of the earth and sea vnder that Parallel is 5516. leagues: So the halfe is 2758. leagues, and a quarter is 1379. leagues, so that 689 leagues and a halfe, shal alter thꝛée houres of time, and 230. leagues, will alter one houre of time in the Eclipses oꝛ aspects of the Moone, &c.

Where the Pole is raised 50. degrées, there the circumference

ference of the whole earth vnder the Parallel is 4628. leagues, and a halfe thereof is 2314. leagues, and the quarter thereof is 1157 leagues: so that 578 leagues and a halfe, doth alter three houres of time: and 193. leagues doth alter an houre of time in that Parallel. In the Latitude of 60. degrées from the Equinoctial in that parallel, it is but 3600 leagues, to go round about the whole earth and sea, so that 1800. leagues is the opposite part of that Parallel, & there your none is midnight. so that 900. leagues shall alter fiue houres of time, and 450. leagues, three houres of time, and 150. leagues shal alter one houre of time in the aspects of the Moone, being the 24. part of the compasse of the earth, in that parallel, &c.

Where that the Pole is rayled 65. degrées, there the circumference in the parallel is 3042. leagues, so that the halfe is 1521 leagues, and a quarter of that Parallel is but 760. leagues and a halfe: So that 380. leagues shall alter three houres of time, and 126. leagues and $\frac{1}{3}$ shall alter one houre of time, &c.

And also in the Latitude of 70. degrées, the compasse of the earth is in the Parallel 2492. leagues, so that the opposite part is 1231. leagues & the quarter is 616. leagues and a halfe, so that 307. leagues and three quarters, doth alter three houres of time, and 102. leagues will alter one houre in the Eclipses, or change of the Moone. And furthermore, in the Altitude of the Pole 75. degrées, there the compasse of the earth in that parallel, is 1864. leagues, and the halfe is 932. leagues, and the quarter is 466 leagues, so that the alteration of three houres of time is 233. leagues, & 77. leagues, & 2. miles will alter an houre of time, &c. And also in the Latitude of eightie degrées from the Equinoctiall, there the whole circumference of the earth vnder that Parallel is but 1250. leagues. And the opposite part in that Parallel is 625. leagues, and then the quarter of that, is but 300. & 12. leagues and a halfe, so that 156. Leagues will alter three houres of time, and fiue and twenty leagues will alter one

houre, in the time of any Eclipse or any aspects of the Moone, so that you may see how short the Circumference of the earth is at the Latitude of eightie degrées: and this I doe cease to shew any further towards the Pole-wards, for that it is doubtfull whether that it is Navigable so nére unto the Poles, &c.

The eighteenth Chapter or rule, sheweth how to sayle by the Globe.

NOW to sayle by the Globe, it is conuenient to be spoken of: For that generally the most part of the Sea-men make their account as though the earth were a flatforme. For they do not consider that the earth is a Globe, and that the Meridians doe grow narrower and narrower towards the poles, for it is impossible to draw the face of the earth and the Sea true vpon a flatforme, for if you will describe the land true, then shall not the Sea be true if your lines be made according to the arte of Hydrographie, for the Sea shall be broader to the North parts than it is, because the Meridians grow together. Now and if you would describe the sea true, with lines, courses, distances, hauens, and dangers, then should your land be broder to the North parts then it is. As for example thus: England and Scotland being both one Iland, in all your Cardes of Navigation, that doth shew any part to the Southwards, the North part of Scotland is drawne much bigger then it is, for otherwise the lines of South and North should not be according to the trenting of the land, for if you view it well, you shall finde the North end of Scotland much more in distance than it is. As you may see in measuring it by the truncke of your carde.

You cannot draw the land and Sea true vpon a flatting.

To make a Sea plat or Card.

For your better vnderstanding, I haue shewed the compasse of the earth vnder sundrie Latitudes in the Chapter going before, and by that you may see that the compasse of the East and West line (comming from the Equinoctiall)

is

is much leſſer to the Northwards, than it is to the Southwards. Wherefore when you ſhall haue any occaſion to attempt any voyage to the North parts, it is beſt to ſayle by a Globe, for ſo ſhall you better ſée the diſtance and bignеſſe of the lands, and in like manner your lines and courſes. In this order, firſt (according to the accuſtomed manner) keepe a perfect account and reckoning of the way of the Ship, by what line or point your Ship hath made her way good, then muſt you reſort to your globe: after that conſider what place and parallel you be in, which you may doe by the Sun by day, and by the Starres by night. Now (knowing what place and Parallel you be in) ſet your Globe to the elevation of your Pole: that done, turne to the place of your Zenith, and ſéeke the oppoſite of it in your Parallel: for then you know that in the ſame Parallel is your Eaſt and Weſt line: that had, the iuſt quarter of that circle to the Pole, muſt be diuided into the eight points of your compaſſe, doing ſo likewiſe on the other ſide. How to vſe the Globe to direct your courſe, and to know how that any place doth beare.

In like caſe if you come to the Southwards, diuide your eight winds from your Antarcticke Pole, to your Parallel circle: & thus muſt you do euer and anon, for the oftner you do obſerue this cuſtome, the better and perfecter ſhall your courſe be. Now thus briefely I make an end of the fayling by the Globe. But for them that do occupie the South parts, nothing is better then their cards. Becauſe I haue declared vnto you the length of certain of the parallels, what leagues the earth doth containe in compaſſe vnder them, now will I ſhew you how many leagues diſtance there is, from one parallel vnto an other, accordingly as I haue ſet downe in the chapter next going before this, where I do ſhew the circumference firſt vnder the Equinoctiall, and then the Latitude of twentie degrées, and then 30. degrées &c. Firſt, from the Equinoctiall vnto the Latitude of twentie degrées is 400. leagues, and from 20. degrées vnto 30. degrées in Latitude, is 200. leagues. The like is from 30. vnto 40. degrées, and from 40. to 50. and from 50. to 60. So that there is from

the

the Latitude of 60. degrés vnto the Equinoctiall 1200. leagues, and there a degrés of Longitude is but halfe so much as it is vnder the Equinoctiall, and the whole circumference of the earth but halfe so much: in like manner from the Latitude of 60. degrés vnto the Pole is but 600. leagues, and there all the Meridians doe méete: and it is from the Equinoctiall vnto either of the two Poles of the world 1800. leagues, &c. which is the fourth part of the compasse of the whole earth.

The cause why that you may see the sailes of a ship, and not the hold.

Furthermore, for that you may the better vnderstand, that the earth is a Globe or Circular (which any person that doth occupie the Sea, séeth most apparantly) you shall perceiue it thus: if you sée a ship any thing far off, you may perfectly sée the saile of it, but not the hold, the cause whereof, is the circularnesse of the earth, and the water of the Sea: for that the water doth arise and swell betwéene you and the other ship, according of the distance betwéene both the Shippes, because the distance of the Center of the Earth or Water, is in euery place alike. And hee that hath desire to know further hereof, M. Dee hath made mention thereof in Euclides Elements, in his Mathematicall preface, and also in the twelfe booke, whither you may haue recourse: yet notwithstanding I will say a little thereof, whereby you may discerne how farre it is possible to sée a ship vpon the Sea: if you be on the sea in a ship, so that there be but halfe a league betwéene you & the other ship, the water will be fiue inches and a halfe higher in the middle of the way betwéen both the ships, for that the water is of equall distance in euery place from the center of the earth, and runneth in a crooked line, the which crooked line being subsended by a right line, the middle most line betwéen two shippes that commeth from the center of the earth, shall be shorter then the other two lines comming from the Center of the earth, vnto the two shippes, by fiue inches and a halfe, then it must néedes be said, that the water is higher by the sayd fiue inches, and a halfe. And furthermore if the two shippes were a league

asunder

asunder, then the water by his circularnesse should be 22. ynches higher then the leuell in the middle betwéne both the shippes.

To know how many foot and ynches that the water is higher then the leuell of the Sea, betweene two shippes.

Furthermore, if the two shippes be two leagues asunder, then the water shall be higher then the leuell in the middle betwéne both the ships, by 88 ynches, which is seuen foote and foure ynches. If the two ships be three leagues the one from the other, then the water shall be higher than the leuell in the mid-way betwéne both the shippes, by 198. ynches which is 16. foote and a halfe.

Furthermore, if the two ships be foure leagues asunder, the water shall be higher then the leuell in the mid-way betwéne both the ships, by 252. ynches, which is 29. foote and foure ynches. And furthermore, if the two ships were fiue leagues asunder, the water should be higher then the leuel in the mid-may betwéne both the ships, by 550. ynches, which is 46. foot lacking two ynches. Yet furthermore, if the 2. ships were 6. leagues asunder, the water should be higher then the leuell in the middle way betwéne them by 792. inches which is 66. foot. Furthermore also, if the two ships were seuen leagues asunder, the water shuld be higher then the leuel in the midway betwéne both the ships by 1878. ynches, and that is 90. foote, which is as far and rather farther then it is possible to sée any ship vpon the Sea: Neither is it possible to sée any land further, but such land as is very high land, which for the greatnesse of the height may be séene, wherefore fiue leagues or seuen leagues is called a kenne.

What a kenne is. The cause why you may see a ship farther out of the top than vpon the hatches.

Now the circularnesse of the earth is the cause why you may sée a ship or land further out of the top, then vpon the hatches: wherefore it is a plaine case, that the earth and sea is not flat, but circular, as is afore declared, &c.

The

The Regiment for the Sea.

The xix. Chapter, is as touching the making of Plats or Cardes for the Sea, and not to paint their Cardes as they doe, but rather to supply the vacant places with other necessarie matters: and also of three necessarie things contained in the Plats or Cards, and their vses, which is the most necessarie thing in Nauigation.

FOr the making of Plats or Cards, as touching Hydrographie, commonly called Sea Cards, I meane to say little thereof: for that it is sufficiently declared in the booke called, the Art of Nauigation: sauing this, I would wish them that be makers of Plats and Cards for the Sea, not to paint their compasses with so many colours: neither vpon the land with so many flags, for ỹ it doth rather hurt then good: although it may be said, they be so painted in vacant places; those vacant places I would wish them to furnish with these two matters, in this order. First, in some vacant place to make a compasse, and to place against euery point of the halfe of the compasse, letters, or some other figures or characters, and in like manner, to make the letter or character at the hauen, port, or place where the mone maketh a ful sea, being vpon that point of the compasse, vpon which the said letter or character doth stand, as for ensample: thus I place A at the East point. B. at the East & by south, C at the East Southeast, D at Southeast and by East, and so consequently to all the points vnto the West: then that being done, where it floweth an East mone, I place A in the Plat or card: and where an East and by South mone, I place B in the Card, & so forth, according to the place of the mone that maketh a full sea. And where it runneth halfe tide vnder other, to make some note vpon the Card in that place, &c.

Not to paint their Sea Cards but to vse the vacant places with other necessarie matter.

This also is very necessary to be done, to furnish vp all the vacant places of the Plat or Card, to draw the shape or fashion of euery head-land or high land alongst euery coast that

To draw the shape of the land in their Cardes.

that is needfull to be known, and at what point of the compasse the land is of that fashion: at how farre off the land riseth in that fashion: and so to make a fashion of the land as often as the land altereth the forme and fashion: and last of all, at what point of the compasse the land hath that shape or fashion: for being vpon one side, the land riseth of one fashion, and on the other side, of another forme or fashion.

And being neere the land, it will be in one fashion, and being farre off in another fashion (as is before declared in the 14. Chapter) for there is nothing more needfull and necessarie for the Sea-men than this, to know the land when he seeth it, and there is no way better to make him remember it, than to haue notes how the land doth rise vpon euery side, and what greater inconuenience may there grow by any meanes, then there may be by mistaking of a place? for it were twentie times better to be throughly perswaded, that he knoweth it not, than to thinke he doth know it, not being that place. For whereas he doth thinke to preuent the dangers, he may willingly runne vpon the dangers, not knowne of him. Therefore in my opinion they can do no better than to furnish their vacant places in their Plats and Carde with this matter. The vse of the Sea Cards is most necessarie for Nauigation for long voyages: first, for that it sheweth you how one place beareth from another: secondly, the distance of any place how far the one is from the other: Of which the one is represented by the lines of the compasse: the other by the scale or truncke of measure, if the Plat be truely made: thirdly, it sheweth you in what Latitude from the Equinoctiall or Altitude of the Pole any place is in, by the line of degrées.

Great infirmities by mistaking any place.

How necessarie a thing the Sea Cards be.

Three necessary things in the Sea Cards.

Now to direct your course through the sea by your Card, to any place assigned, you must looke by what point of the compasse it beareth from you, from the place you mean to set off from the land, vnto the place you would first fall with. Which you shall know thus: seeke a line from the next compasse, vnto the place you meane to depart from, the open your

To know how any place doth beare from you, by the Card.

Compasses

Compasses vnto one of those lines by your iudgement that falleth nere vnto your place assigned: and let the other fote of your Compasses stand iust at that place where your Ship is, when you direct your course: that done, beare your hands forwards euen, & let the one end be still vpon the line to the which you did open your Compasses, vntil you come to your place assigned. But if it falleth short of the place assigned, then take the next line nearer vnto the place you departed from: when you haue so done, if your Compasses do ouerreach the place assigned, then take a line further off from the place you doe meane to set off from: and so shall you see by what point of the compasse the place assigned doth beare from you, &c. If you would know how far the place assigned is from you, set the one fote of the compasses vpon the place you depart from, and stretch out the other fote vnto the place assigned iust: that done (keeping your compasses at that extent) set them to the scale or trunke of measure, and that will shew you iustly how many leagues it is from the place of your departing vnto the place assigned. If the distance betwéen the two places be more then the compasses wil reach at once, then first set your compasse vnto the scale, opening the compasse vnto 100. leagues more or lesse, as your scale and compasses will giue you leaue at your discretion; after that set the one fote at the place of your departing, and the other fote of the Compasses right towards the place assigned, as oftentimes as the distance betwéene the two places doth require, & then (the compasses being opened vnto 100. leagues) you may conclude it to be so many hundred leagues vnto the place assigned, as the compasses did shew vnto you: but if there be any odde measure, then open your compasses to that quantitie, and set that to the scale, and it will shew you the iust content of that measure, more than so many hundred leagues, &c. Furthermore, touching the third commoditie, which is to know what Latitude any place assigned hath: set one fote of the compasses vnto the place assigned, and open the compasses vnto the next East and West line, then

To know how farre it is vnto any place by the Carde.

To know what latitude or height of the Pole any place hath by the Carde.

then carrie that vnto the line of Degrées, képing the foote of the Compalles vnto the Eaſt and Weſt line, it will ſhew iuſtly the number of degrées that the Pole is aboue the Horizon.

So of theſe three waies, by the firſt is knowen by what point of the Compaſſe any place beareth from you. By the ſecond is knowen how farre diſtance it is vnto any place aſſigned. And by the third is knowen in what height the Pole is, in any place aſſigned, &c. Now this being knowne, you may with the more eaſe know how to attaine to come vnto the port or place aſſigned.

Yet furthermore there is to be conſidered (in directing the courſe of a Shippe to any place aſſigned) what impediments may be by the way: as tides, currents, or the ſcantneſſe of the wind, which may put the Shippe vnto the léwards of his courſe, as alſo the ſurging of the Sea: and all this muſt be conſidered by the maiſter and Pilot of the ſhip. Likewiſe alſo in long voyages, the wind may often ſhift vpon him, and ſometime the wind may be ſuch as he cannot lye his courſe: wherefore he muſt kéepe a perfect account of the Shippes way, and conſider what point the Shippe hath made her way good by. And at euery time that the wind doth ſhift, and the ſhip cannot lye her courſe, to note in the Card or Plat in what place the ſhippe may be: in hauing a ſpeciall regard vnto the way of the ſhippe, as touching the ſwiftneſſe or ſlowneſſe that the ſhippe goeth: and if ſo be the weather be cleare either by night or day, to take the true Altitude of the Pole: for by that they may correct the ſhips way, and giue a very neare geſſe, how the place (aſſigned to goe vnto) doth beare from them, as alſo how farre it is thither, ſauing onely in the Eaſt and Weſt courſe: and then they haue no other help but only the very account of the ſhips way.

Things to be conſidered by the Maiſter or Pilot of a ſhip.

They may correct the Ships way by the taking the height of the Pole.

And to correct their dead reckoning by the Altitude of the Pole, they muſt doe this: (eſpecially if the ſhippe haue had often trauerſe, by the meanes of contrarie winds; ſo that ſhe could

could not lye her course,) consider vpon the Card or Plat how long the shippe hath made her way good, for so many points as the shippe hath sailed by: then (if by the Altitude of the Pole the ship hath gone more then the dead reckening did shew you) repaire vnto the line of degrées, and set the one foote of the Compasse vpon the degrée and place of the height of the Pole, and the other vpon the next East and West line: that done, beare it vnto the place you suppose the ship to be in, and then bring forwards with the other Compasses, what point of the Compasse the ship hath sailed by, and at the meeting time of the two paire of Compasses, make a note for the place that the ship is in: from which place you may with your compasses see, how the place assigned doth beare, and also how farre off you be from the same.

Furthermore (if you finde by the height of the Pole that you are not far short, as your reckoning did shew vnto you) you must pull backe so much from the point that the shippe hath sailed by, as the height of the Pole doth shew vnto you by the ouer before rehearsed, &c.

To know how farre that the land is off from you by the sight of the land with your compasse, to do it vpon the land.

Furthermore (as I haue declared vnto you in the 14. Chapter going before) how to know how farre the land is off from you, (the distance betweene any two places being known) by setting the land with your compasse, euen so you may do the like by your Card, as thus: setting the two places with your Compasse, and knowing that the two places be so many leagues asunder, then shall you repaire to the Card, and according to the bearing of the two places by the points of the Compasse, you (being thwart of one of those two places) shall apply it with your Compasses vnto your Scale: But for that in the Scale the leagues be so small, you may assigne twenty leagues to be but one league, & open the compasses vnto that proportion that the two places be asunder, and the one of them doth beare from the other: that done, open the Compasses againe from the Center of the compasse, vnto the place that you doe imagine to be the Land, & then apply it vnto the trunke of measure, and you shall see how

many

many Leagues you be from the shore, and so forth. So that you may see that the Plat or Card is one of the necessariest things that is to be used in Nauigation. If you desire a full and perfecter vse of the Card, reade the booke called, The Mariners guide, wherein the vse of the Card is handled at large.

The 20. Chapter is of the Longitude and declination of 32. notable fixed Starres, very necessarie for Nauigation, with tables of their shining, and at what point of your Compasse they do both rise and set: and also tables for euery moneth of the yeere, declaring at what houre and minute they be South, running from the first day of the moneth to the fifteenth, and from the fifteenth to the last day, and will continue these 100. yeeres without much error.

And furthermore, I doe thinke it conuenient for diuers considerations, to shew the longitude and declination of certaine of the most notablest fixed Starres that are neere vnto the Equinoctiall, to the number of 32. of them, which are very necessarie for Nauigation in diuers respects, as this: if you be vnto the North parts where the North Pole is raised more than 50. or 60. degrees, then the North starre is too high to be obserued or taken with the crosse staffe, (as I haue declared in the first Chapter) and it may chance so that in the day the Sunne is not to be seene at noone, and then these starres may serue your turne in the night.

If the Pole be raised more than 50. or 60. degrees, it is to high to be obserued by the crosse staffe.

And furthermore they be very good for them that haue occasion to trauaile beyond the Equinoctiall, where the North Pole is vnder the Horizon, in taking their declination as they do the Sunnes declination in all points, which doth appeare in the 7. 8. and 9 Chapters of this booke. And furthermore

These starres will serue beyond the Equinoctiall.

To know the rising and setting of the starres in all places by the order of the xi. Chapter.

The order of the Table following.

thermore they be very necessarie for seafaring men to know the houres of the night, both by their being upon the Meridian, and also by their rising and setting: you may know the true time of their rising and setting in every Latitude by their declination from the Equinoctiall, whether they decline to the South parts, or North parts, as is declared by the declination of the Sunne in the II. Chapter.

And furthermore, by any of the Starres you may try the variation of your compasse by night, &c. Now shall follow the Table of all these starres. The first row of this Table containeth the names of the starres. The second, the signes whereunto the Longitude of the starres is referred. The third, the degrées of the signes. The fourth, the minutes belonging thereunto. The fift, the degrées of declination. The sixt, the odde minutes belonging thereunto. The seaventh sheweth towards what part they decline, by letters, of which N. signifieth Septentrionall, or North declination, S. signifieth Meridionall, or south declination: as in the Table doth appeare. The eight doth shew nothing but the bignesse of the starres. Now followeth the Table.

A Table

A Table of the fixed Starres, newly corrected by *T. Hood*, according to their longitude, 1600.

	The names of the Stars.	Signes.	Longi. deg. mi.	Declin. deg. mi.	To what part the ſtars decli	The mag. or highneſſe of the ſtarres.
1	Whales backe	Aries	6. 25.	12.20	S declin.	3 mag:
2	Whales belly	Aries	16.25	12.22	S declin.	3 mag:
3	Rammes horne	Aries	28. 5	17.17	N declin.	3 mag:
4	Rammes head	Taurus	2. 25	21.33	N declin.	3 mag:
5	Wailes eye	Gemini	4. 5	15.38	N declin.	1 mag:
6	Orions left foote	Gemini	10. 35	8. 43	S declin.	1 mag:
7	Orions left ſhoulder	Gemini	14.45	5. 56	N declin.	1 mag:
8	Orions girdle the firſt	Gemini	18.45	0. 38	S declin.	2 mag:
9	Orions right ſhoulder	Gemini	23.25	6. 17	N declin.	1 mag:
10	Great Dogge	Cancer	9. 5	16.12	S declin.	1 mag:
11	Leſſer Dogge	Cancer	20.35	6. 13	N declin.	1 mag:
12	Brighteſt in Hydra	Leo	21.25	6. 53	S declin.	2 mag:
13	Lions necke	Leo	23.35	21.52	N declin.	2 mag:
14	Lions heart	Leo.	23.55	13.55	N declin.	1 mag:
15	Lions backe	Virgo	5. 35	22.43	N declin.	2 mag:
16	Lions taile	Virgo	16. 5	16.50	N declin.	1 mag:
17	Rauens head	Libra	5. 45	20.45	S declin.	3 mag:
18	Rauens wing	Libra	9. 25	15.16	S declin.	3 mag:
19	Virgins ſpike	Libra	18. 5	9. 0	S declin.	1 mag:
20	Arcturus betwixt	Libra	18.25	21.20	N declin.	1 mag:
21	Bootes legges.	Scorpi.	9. 25	14.14	S declin.	2 mag:
22	South balance	Scorpi.	13.35	7. 46	S declin.	2 mag:
23	North balance	Sagit.	4. 5	25.25	S declin.	3 mag:
24	Scorpions heart	Sagit.	16.15	14.57	N declin.	3 mag:
25	Hercules head	Scorp.	10.15	12.57	N declin.	4 mag:
26	Serpents head	Capri.	25.15	7. 54	N declin.	2 mag:
27	Eagle	Aquar.	9. 5	10. 0	N declin.	3 mag:
28	Dolphins taile	Aquar.	16.45	17.51	S declin.	3 mag:
29	Goats taile	Piſces	3. 5	18.10	S declin.	3 mag:
30	Aquarius legge	Piſces	18. 5	12.58	N declin.	2 mag:
31	Pegaſus ſhoulder	Piſces.	23.35	25.58	N declin.	2 mag:
32	Pegaſus legge	Piſces	27. 5	20.12	S declin.	3 mag:
33	Whales taile					

How to vse the ſtarres declination to know the height of the Pole.

The vſe of this Table is this: when you haue taken the height of any of theſe ſtarres vpon the Meridian, then loke what declination the ſtarre hath from the Equinoctiall, and whether it declineth toward that Pole, which is aboue the Horizon, or toward that Pole which is vnder the Horizon. If the ſtarre declineth toward that Pole which is aboue the Horizon, ſubſtract the declination from the meridian altitude thereof, the remainder gineth the height of the Equinoctiall. If the ſtarre declineth toward that pole which is vnder the Horizon, adde the declination to the meridian altitude thereof, the totall ſumme gineth the height of the Equinoctiall, and then by the height of the Equinoctiall, the height of the Pole is knowne, as the ſeuenth Chapter doth declare.

And now I think it conuenient to make certaine Tables, to ſhew vnto you at what houre and time any of theſe ſtars be vpon the Meridian, whereby they may the better know theſe ſtarres. I wil alſo ſhew vnto you how long any of theſe ſtarres doe ſhine or tarrie aboue the Horizon in the Latitude from the Equinoctiall of London, that is at 51. or 52. degrées. And alſo at what point of the compaſſe any of theſe ſtarres do riſe or ſet, which will ſerue this 100 yéares, without much errour.

A Table to know the riſing and ſetting of theſe Starres, by what point of the Compaſſe, and how many houres they be aboue our Horizon, the Pole being raiſed 51. or 52. degrees.

THe Whales back riſeth Eaſt and by South, and vnto the Southwards: and ſhineth ten houres and better.

The Whales belly (in a manner) as the Whales backe.

The Rammes horne riſeth Eaſt Northeaſt, and ſetteth Weſt Northweſt: and ſhineth 15. houres 16. minutes.

The Rammes head riſeth Eaſt Northeaſt, and ſetteth Weſt Northweſt: and ſhineth 16. houres 4. minutes.

The

The Bulles eye riseth nere the East Northeast, and setteth nere ỹ west Northwest, & shineth 15. houres 2. minuts.

Orions left fote riseth nere the East and by South, and setteth nere the west and by South, and shineth 10. houres and 9. minutes.

Orions left shoulder riseth East & to ỹ Northwards, & setteth west & to the Northwards, & shineth 12. houres 45 min.

The first in Orions girdle doth rise a little to the southwards of the East, and setteth a little to the southwards of the west, and shineth 11. houres 46. minutes.

Orions right shoulder riseth East, and vnto the Northwards, and setteth west and vnto the Northwards, and shineth 13. houres 12 minutes.

The great Dog riseth East southeast, and setteth west southwest, and shineth 9. houres.

The leller Dog riseth East & vnto ỹ northwards, & setteth west, & vnto the Northwards, & shineth 13. houres 10. min.

The brightest in Hydra riseth East and vnto the Southward, and setteth west and vnto the southwards, and shineth 11. houres and 7. minutes.

The Lyons neck riseth East northeast, and to the Northwards and setteth west northwest, and to the Northwards, and shineth 16. houres 16. minutes.

The Lions hart riseth nere the East Northeast, & setteth nere the west northwest, & shineth 14. houres 50. minutes.

The Lions backe riseth nere the northeast and by East, and setteth nere the northwest and by west, and shineth 16 houres 26. minutes.

The Lions taile riseth nere the east northeast, and setteth nere the west northwest, and shineth 15. houres 12. minutes.

The Ravens head riseth nere the east southeast, & setteth nere the west southwest, and shineth 8. houres 12. minutes.

The Ravens wing riseth nere the East southeast, & setteth nere the west southwest, & shineth 8. houres 50. minutes.

The Virgins spike riseth East & to the southwards, & setteth west & to the southwards, & shineth 11. houres 4. minu.

Arcturus betweene Bootes thighs, riseth neere the Northeast and by East, and setteth neere the Northwest and by West, and shineth 16. houres 20. minutes.

The South Wallance riseth neere the East southeast, & setteth neere the west southwest: and shineth 9 houres 36. min.

The North Wallance riseth neere the East and by south, and setteth neere the west and by south, & shineth 10. houres 38. minutes.

The Scorpions heart riseth neere the Southeast and by East, and setteth neere the south west and by west, and shineth 7. houres 5. minutes.

Hercules head riseth neere the East Northeast, and setteth neere the west northwest, & shineth 14 houres 56. minutes.

The serpents head riseth neere the East northeast, & setteth neere the west northwest, & shineth 14. houres, 40. minutes.

The Eagle riseth neere the East and by North, & setteth neere the west & by North: & shineth 13. houres 24 minutes.

The Dolphins taile riseth East and by North, and setteth West and by North, and shineth 15. houres 57. minutes.

The Goates taile riseth neere the East Southeast, & setteth west Southwest, and shineth 9. houres 20. minutes.

Aquarius leg riseth neere the East Southeast, and setteth west Southwest, and shineth eight houres 54. minutes.

Pegasus shoulders riseth neere the East Northeast, and setteth neere the west Northwest, and shineth 14. houres 32 minutes.

Pegasus legge riseth neere the Northeast, and setteth neere the Northwest, and shineth 17. houres 6 minutes.

The Whales taile riseth East southeast, and setteth west Southwest, and shineth 7. houres 48. minutes.

The 11. Chap. will shew how long any of these starres will shine in all places.

Furthermore, if you desire to know the time of any of the starres, being about the Horizon in all Latitudes, then repaire to the 11. Chapter, so you shall know it there by their declination: even by the same order that you know the Sunnes being above the Horizon, by the Sunnes Declination.

25.18 2.40 24.50
10 23.10 23: These
5.06 2.30 1.40

A Table of the fixed Starres.

	These Stars being south from the first day of Ianuarie vnto the 15.			Ianua. from the 15. to the last.			Febru. from the first to the 15.			Febru. from 15. to the last	
1	Whales backe	5.20	E	1	4.20	DA	1	3.20	DA	1	2.20
2	Whales belly	5.54	E	2	4.54	DA	2	3.54	DA	2	2.54
3	Rammes horne	6.28	E	3	5.28	E	3	4.28	DA	3	3.28
4	Rammes head	6.45	E	4	5.45	E	4	4.45	DA	4	3.45
5	Bulles eye	8.52	E	5	7.52	E	5	6.52	E	5	5.52
6	Orions left foote	9.23	E	6	8.23	E	6	7.23	E	6	6.23
7	Orions left shoulder	9.28	E	7	8.28	E	7	7.28	E	7	6.28
8	First orions girdle	9.50	E	8	8.50	E	8	7.50	E	8	6.50
9	Orions right shoulder	10 12	E	9	9.12	E	9	8.12	E	9	7.12
10	Great Dogge	11.4	E	10	10.4	E	10	9.4	E	10	8.4
11	Lesser Dogge	12.0	E	11	11.0	E	11	10.0	E	11	9.0
12	Brightest in Hydra	12.4	E	12	11.4	E	12	10.4	E	12	9.4
13	Lions necke	2 12	M	13	1.12	M	13	12.12	M	13	11.12
14	Lions heart	2.13	M	14	1.13	M	14	12.13	M	14	11.13
15	Lions backe	3.0	M	15	2 0	M	15	1.0	M	15	12.0
16	Lions taile	3.42	M	16	2.42	M	16	1.42	M	16	1.42
17	Ravens head	5.2	M	17	4.2	M	17	3.2	M	17	2.2
18	Ravens wing	5.19	M	18	4.19	M	18	3.19	M	18	2.19
19	Virgins spike	5.51	M	19	4 51	M	19	3.51	M	19	2.51
20	Twixt boots thighs	5.56	M	20	4.56	M	20	3.56	M	20	2.56
21	South ballance	7.16	M	21	6.16	M	21	5.16	M	21	4 56
22	North ballance	7.33	MD	22	6.33	M	22	5.53	M	22	4.33
23	Scorpions heart	8.54	MD	23	7.54	MD	23	6.54	M	23	5.54
24	Hercules head	9.14	MD	24	8.14	MD	24	7.14	MD	24	6 14
25	Serpents head	9.41	MD	25	8.41	MD	25	7.41	MD	25	6.41
26	The Eagle	12.19	DA	26	11.19	MD	26	10.19	MD	26	9.19
27	Dolphins taile	1.12	DA	27	12.12	DA	27	11 12	MD	27	10.12
28	Goats taile	1.48	DA	28	12.48	DA	28	11.48	MD	28	10.48
29	Water pourers leg	2.48	DA	29	1.48	DA	29	12.48	DA	29	11.48
30	Pegasus shoulder	3.47	DA	30	2.47	DA	30	1.47	DA	30	12.47
31	Pegasus legge	4.12	DA	31	3.12	DA	31	2.12	DA	31	1.12
32	Whales taile	4.24	DA	32	3.24	DA	32	2.24	DA	32	1.24

A Table of the fixed Starres.

March from the first to the 15.			March from the 15. to the last.			Aprill from the first to the 15.			Aprill from the 15. to the last.			May from the first to the 15.		
1	1.20	DA	1	11.20	DA	1	11.20	MD	1	10.20	MD	1	9.20	MD
2	1. 54	DA	2	12 54	DA	2	11.54	MD	2	10 54	MD	2	9.54	MD
3	2.28	DA	3	1.28	DA	3	12.28	DA	3	11.28	DA	3	10 28	MD
4	2.45	DA	4	1.45	DA	4	12 45	DA	4	11.45	DA	4	10.54	MD
5	4. 52	DA	5	3.52	DA	5	2.52	DA	5	1.52	DA	5	12.52	DA
6	5. 23	DA	6	4.23	DA	6	3.23	DA	6	2.23.	DA	6	1.23	DA
7	5.28	DA	7	4 28	DA	7	3.21	DA	7	2 28	DA	7	1.28	DA
8	5. 50	DA	8	4.50	DA	8	3.50	DA	8	2.50	DA	8	1.50	DA
9	6.12	E	9	5.12	DA	9	4.12	DA	9	3.12	DA	9	2.12	DA
10	7.4	E	10	6.4.	DA	10	5.4	DA	10	4 4	DA	10	3 4	DA
11	8.0	E	11	7.0	E	11	6.0	DA	11	5.0	DA	11	4.0	DA
12	8.4	E	12	7.4	E	12	6.4	DA	12	5.4	DA	12	4.4	DA
13	10.12	E	13	9.12	E	13	8.12.	E	13	7.12	DA	13	6.12	DA
14	10.13	E	14	9.13	E	14	8.13	E	14	7.13	DA	14	6.13	DA
15	11.0	E	15	10.0	E	15	9.0	E	15	8.0	E	15	7.0	DA
16	11.42	E	16	10.42	E	16	9.42	E	16	8.42	E	16	7.42	DA
17	1.2	M	17	12.2	M	17	11.2	E	17	10.2	E	17	9 2	E
18	1.19	M	18	12.19	M	18	11.19	E	18	10.19	E	18	9.19	E
19	1.51	M	19	12.51	M	19	11.51	E	19	10.51	E	19	9 51	E
20	1.56	M	20	12.56	M	0	11.56	E	20	10.56	E	20	9.56	E
21	3.16	M	21	2.16	M	21	1.16	M	21	12.16	M	21	11.16	E
22	3.33	M	22	2.23	M	22	1.33	M	22	12.33	M	22	11.33	E
23	4.54	M	23	3.54	M	23	2.56	M	23	1.54	M	23	12.54	M
24	5.14	M	24	4.14	M	24	3.14	M	24	2.14	M	24	1.14	M
25	5.41	M	25	4.41	M	25	3.41	MD	25	1.41	M	25	3.41	M
26	8.19	MD	26	7.19	MD	26	6.19	MD	26	5 19	MD	26	4 19	M
27	9.12	MD	27	8 12	MD	27	7.12	MD	27	6.12	MD	27	5.12	MD
28	9.48	MD	28	8 48	MD	28	7 48	MD	28	7.48	MD	28	5.48	MD
29	10.48	MD	29	9.48	MD	29	8.48	MD	29	7.48	MD	29	6.48	MD
30	11.47	MD	30	10.47	MD	30	9.47	MD	30	8.47	MD	30	7.47	MD
31	12.12	DA	31	11.22	MD	31	10.12	MD	31	9.12	MD	31	8.12	MD
32	12.24	DA	32	11.24	MD	32	10 24	MD	32	9.24	MD	32	8.24	MD

May from the 15. to the last.			June from the first to the 15.			June from the 15. to the last.			July from the first to the 15.			July from the 15. to the last.		
1	8.20	MD	1	7.20	MD	1	6.20	MD	1	5.20	MD	1	4.20	M
2	8.54	MD	2	7.54	MD	2	6.54	MD	2	5.54	MD	2	4.54	MD
3	9.28	MD	3	8.28	MD	3	7.28	MD	3	6.28	MD	3	5.28	MD
4	9.45	MD	4	8.45	MD	4	7.45	MD	4	6.45	MD	4	5.45	MD
5	11.52	MD	5	10.52	MD	5	9.52	MD	5	8.52	MD	5	7.52	MD
6	12.23	DA	6	11.23	MD	6	10.23	MD	6	9.23	MD	6	8.23	MD
7	12.28	DA	7	11.28	MD	7	10.28	MD	7	9.28	MD	7	8.28	MD
8	12.50	DA	8	11.50	MD	8	10.50	MD	8	9.50	MD	8	8.50	MD
9	1.12	DA	9	12.12	DA	9	11.12	MD	9	10.12	MD	9	9.12	MD
10	2.4	DA	10	1.4	DA	10	12.4	DA	10	11.4	MD	10	10.4	MD
11	3.0	DA	11	2.0	DA	11	1.0	DA	11	12.0		11	11.0	MD
12	3.4	DA	12	2.4	DA	12	1.4	DA	12	12.4	DA	12	11.4	MD
13	5.12	DA	13	4.12	DA	13	3.12	DA	13	2.12	DA	13	1.12	DA
14	5.13	DA	14	4.13	DA	14	3.13	DA	14	2.13	DA	14	1.13	DA
15	6 0	DA	15	5 0	DA	15	4.0	DA	15	3.0	DA	15	2.0	DA
16	6.42	DA	16	5.42	DA	16	4.42	DA	16	3.42	DA	16	2.42	DA
17	8.2	DA	17	7.2	DA	17	6.2	DA	17	5.2	DA	17	4.2	DA
18	8.19	DA	18	7.19	DA	18	6.19	DA	18	5.19	DA	18	4.19	DA
19	8.51	DA	19	7.51	DA	19	6.51	DA	19	5.51	DA	19	4.51	DA
20	8.56	DA	20	7.56	DA	20	6.56	DA	20	5.56	DA	20	4.56	DA
21	10.16	E	21	9.16	DA	21	8.16	DA	21	7.16	DA	21	6.16	DA
22	10.33	E	22	9.33	DA	22	8.33	DA	22	7.33	DA	22	6.33	DA
23	11.54	E	23	10.54	E	23	9.54	DA	23	8.54	DA	23	7.54	DA
24	12.14	M	24	11.14	E	24	10.14	E	24	9.41	E	24	8.14	E
25	12.41	M	25	11.41	E	25	10.41	E	25	12.19	E	25	8.41	E
26	3.19	M	26	2.19	M	26	1.19	E	26	9.14	DA	26	11.19	E
27	4.12	MD	27	3.12	M	27	2.12	M	27	1.12	M	27	12 12	M
28	4.48	MD	28	3.48	M	28	2 48	M	28	2.48	M	28	12.48	M
29	5.48	MD	29	4.48	MD	29	3.48	M	29	2.48	M	29	1.48	M
30	6 47	MD	30	5.41	MD	30	4.47	MD	30	3.47	M	30	2.47	M
31	7.12	MD	31	6.12	MD	31	5.12	MD	31	4.12	MD	31	3.12	M
32	7.24	MD	32	6.24	MD	32	5.24	MD	32	2.24	MD	32	3.24	M

A Table of the fixed Starres.

Auguſt from the firſt to the 15.			Auguſt from the 15. to the laſt.			Septem. from the firſt to the 15.			Septem. from the 15. to the laſt.			Octob. from the firſt to the 15.		
1	3.20	M	1	2.20	M	1	1.20	M	1	12.20	M	1	11.20	E
2	3.54	M	2	2.54	M	2	1.54	M	2	12.54	M	2	11.54	E
3	4.28	M	3	3.28	M	3	2.28	M	3	1.28	M	3	12.28	M
4	3.45	MD	4	3.45	M	4	2.45	M	4	1.45	M	4	12.45	M
5	6.52	MD	5	5.52	MD	5	4.52	M	5	3.52	M	5	2.52	M
6	7.23	MD	6	6.23	MD	6	5.23	M	6	4.23	M	6	3.23	M
7	7.28	MD	7	6.28	MD	7	5.21	M	7	4.28	M	7	3.28	M
8	7.50	MD	8	6.50	MD	8	5.50	MD	8	4.50	M	8	3.50	M
9	8.12	MD	9	7.12	MD	9	6.12	MD	9	5.12	M	9	4.12	M
10	9.4	MD	10	8.4	MD	10	7.4	MD	10	6.4	MD	10	5.4	M
11	10.0	MD	11	8.0	MD	11	8.0	MD	11	7.0	MD	11	6.0	M
12	10.4	MD	12	9.4	MD	12	8.4	MD	12	7.4	MD	12	6.4	M
13	12.12	DA	13	11.12	MD	13	10.12	MD	13	9.12	MD	13	8.12	MD
14	12.13	DA	14	11.13	MD	14	10.13	MD	14	9.13	MD	14	8.13	MD
15	1.0	DA	15	12.0		15	11.0	MD	15	10.0	MD	15	9.0	MD
16	1.42	DA	16	12.42	DA	16	11.42	MD	16	10.42	MD	16	9.42	MD
17	2.3	DA	17	2.2	DA	17	1.2	DA	17	12.2	DA	17	11.2	MD
18	3.19	DA	18	2.19	DA	18	1.19	DA	18	12.19	DA	18	11.19	MD
19	3.51	DA	19	2.51	DA	19	1.51	DA	19	12.51	DA	19	11.51	MD
20	3.56	DA	20	2.56	DA	20	1.56	DA	20	12.56	DA	20	11.56	MD
21	5.16	DA	21	4.16	DA	21	3.16	DA	21	2.16	DA	21	1.16	DA
22	5.33	DA	22	4.33	DA	22	3.33	DA	22	2.33	DA	22	1.33	DA
23	6.54	DA	23	5.54	DA	23	4.54	DA	23	3.54	DA	23	2.54	DA
24	7.14	DA	24	6.14	DA	24	5.14	DA	24	4.14.	DA	24	3.14	DA
25	7.41	DA	25	6.41	DA	25	5.41	DA	25	4.41	DA	25	3.41	DA
26	12.19	E	26	9.19	E	26	8.19	E	26	7.19	E	26	6.19	E
27	11.12	E	27	10.12	E	27	9.12	E	27	8.12	E	27	7.12.	E
28	11.48	E	28	10.48	E	28	9.48	E	28	8.48	E	28	7.48	E
29	10.48	M	29	11.48	E	29	10.48	E	29	9.48	E	29	8.48	E
30	1.47	M	30	12.47	E	30	11.47	M	30	10.47	E	30	9.47	E
31	1.12	M	31	1.12	M	31	12.12	M	31	11.12	E	31	10.12	E
32	2.24	M	32	1.24	M	32	12.24	M	32	11.24	E	32	10.24	E

	Octo. from the 15. to the last.		Nouem. from the first to the 15.		Nouem. from the 15. to the last.		Decem. from the first to the 15.		Decem. from the 15. to the last.	
1	10.20	E	1 9.20	E	1 8 20	E	1 7.20	E	1 6.20	E
2	14.54	E	2 9.54	E	2 8.54	E	2 7.54	E	2 6.54	E
3	11.28	E	3 10.28	E	3 9.28	E	3 8.28	E	3 7.28	E
4	11.45	E	4 10.45	E	4 9.45	E	4 8.45	E	4 7.45	E
5	1.52	M	5 12.42	M	5 11.52	E	5 10.52	E	5 9.52	
6	2.23	M	6 1.23	M	6 12.23	M	6 11.23	E	6 10.23	E
7	2.28	M	7 1.28	M	7 12.28	M	7 11.28	E	7 10.28	E
8	2.50	M	8 1.50	M	8 12,50	M	8 11.50	E	8 10.50	E
9	3.12	M	9 2.12	M	9 1.12	M	9 12.12	M	9 11.12	E
10	4 4	M	10 3.4	M	10 2.4	M	10 1.4	M	10 12.4	M
11	5.0	M	11 4.0	M	11 3.0	M	11 2.0	M	11 1.0	M
12	5.4	M	12 4.4	M	12 3.4	M	12 2.4	M	12 1.4	M
13	7.12	MD	13 6.12	M	13 5.12	M	13 4.12	M	13 2.12	M
14	7.13	MD	14 6.13	M	14 5.13	M	14 4.13	M	14 2.13	M
15	8.0	MD	15 7.0	M	15 5.0	M	15 4.0	M	15 4.0	M
16	8.42	MD	16 7.42	MD	16 6.42	M	16 5.42	M	16 4.42	M
17	10.2	MD	17 9 3	MD	17 8.2	MD	17 7.2	M	17 6.2	M
18	10.19	MD	18 9.19	MD	18 8.19	MD	18 7-19	M	18 6.19	M
19	10.51	MD	19 9.51	MD	19 8.51	MD	19 7.51	MD	19 6.51	M
20	10.56	MD	20 9.56	MD	20 8.56	MD	20 7.56	MD	20 6.56	M
21	12.16	DA	21 11.16	MD	21 10 16	MD	21 9 16	MD	21 8.16	MD
22	12.33	DA	22 11.33	MD	22 10.33	MD	22 9.33	MD	22 8.33	MD
23	1.54	DA	23 12.54	DA	23 11.54	MD	23 10.54	MD	23 9.54	MD
24	2.14	DA	24 1.14	DA	24 12.14	DA	24 11.14	MD	24 10.14	MD
25	2.41	DA	25 1.41	DA	25 12.41	DA	25 11.41	MD	25 10.41	MD
26	5.19	DA	26 4.19	DA	26 3.19	DA	26 2.19	DA	26 1.19	DA
27	6.12	E	27 5.12	E	27 4.12	E	27 3.12	DA	27 2.12	DA
28	6.48	E	28 5 48	E	28 4.48	E	28 3.48	DA	28 2.48	DA
29	7.48	E	29 7.48	E	29 5.48	E	29 4.48	E	29 3.48	DA
30	8.47	E	30 7.47	E	30 6.47	E	30 5.47	E	30 4 47	E
31	9.12	E	31 8 12	E	31 7.12	E	31 6.12	E	31 5.12	E
32	9.24	E	32 8.24	E	32 7.24	E	32 6.24	E	32 5.24	E

NOw this Table serueth for euery moneth in the yéere (being exactly calculated) the time of their being south, or touching your Meridian (or as some terme it) Mone-stead, serning very well the Sea-men to take the height of them with their instruments vpon the Sea, referring it vnto the Table of declination that goeth before: the first is the houres, the second minutes, the third be the letters that shew you whether they be south by day or by night, in the euening or morning, in the forenoone or afternoone, of which the letter E doth signifie Euening, the letter M signifieth Morning, the letters MD signifieth morning in the day, and the letters DA signifieth day in the afternoone (as I said before) the very houre and minute of their being South. Now you sée that I haue put to their being South in the day, as well as in the night, to the intent to know the houre of the night as wel by their setting, as also by your compasse, which I shewed you in the first chapter of rule, namely, to bring your 32. points into 24. houres: and in like manner, in the fourth chapter by shining of the Moone to diuide the shining into equall parts, then those parts being equally diuided with the houre and minutes, the time of their shining before their being South, sheweth the iust rising of the starres, and the other time of their shining after their being South sheweth their setting (as I haue declared in the rule of the shining of the Moone.) Now (séeing the Table runneth from the first day of euery moneth to the 15. From the 15. to the last day,) if you will know the exact time betwéene the first day and the 15. day, and betwixt the 15. day, and the last, doe this, loke how many daies of the moneth is past, either from the first day or 15. day, and pull so many times foure minutes from that number as there are daies past, either from the first or 15 day, the remainder will shew you the true time of their being South. That knowne, you shall doe (as is afore said) for there rising and setting.

The significa-tion of the letters in the Table.

The

The 21. Chapter sheweth you the making of a generall instrument, to know the houre of the day by, throughout all the world.

NOw for the making of your Instruments for the Sea, with their vses, you may repaire to the booke of Nauigation made by Martin Curtise a Spaniard, imprinted by M. Iugge, late Printer to the Quænes Maiestie: Else I would haue shewed you the making of diuers instruments, as also the making of the Equinoctiall diall with his vse, which is very profitable to know the houre of the day by, in all Latitudes through the whole world, for your Compasse is not to know the houre of the day by the summer, neither in the morning nor Euening, neither can you know when the Moone is East or West, shée hauing North declination, as being in the signe of Taurus, Gemini, Cancer, or Leo, because your Compasse standeth flat as doth your Horizon. Wherfore it is very good for sea men to vse the equinoctial Dials, for that it sheweth them the true houre of the day in all Latitudes, and also the Moone doth giue a true shadow in that Diall in all Latitudes, for I do know that Sea-men are very many times deceiued where it doth flow an East and West Moone, or any Point betweene the Southeast and Northeast. Because in setting the Moone with their compasse (being in the North signes,) she séemeth to be East by the compasse, when she is nére the East Southeast in her course: and in like manner when the Moone séemeth west by the compasse, shée shall be a little more than west Southwest in her course: which is a very perilous matter to them that should put into a tide, harbour, or hauen, where hée knoweth there is water inough for him, if that he doth come at a full sea, and then by the error, of the moones shadow vpon the Compasse he is deceiued: and when he findeth the error, he thinketh that the cause thereof commeth by the occasion of some storme of wind that is like to follow, imputing it thereto, that the tide doth not kéepe his course, whereas

The Sun and Moone doe giue a full shadow by the compasse.

The Equinoctiall diall giueth a true shadow all the world ouer.

A perillous matter.

whereas the very cause groweth by no other meanes then by receiuing a false shadow by the Horizontall compasse: which falleth out, especially if the Moone be neere her greatest declination, vnto the North parts, that is in the signe of Gemini and Cancer. And also the effect is most perceiued if the Dragons head be in the beginning of the signe of Aries: for then if the Moone be in the beginning of Cancer, she shall haue 5. degrées more in declination from the equinoctial then the sun shall haue at his greatest declination vnto the north parts. So that reseruing the Moones paralax (which is according vnto the latitude of any place) the Moone shall be declined 28. degrées and a halfe vnto the north part of the Equinoctiall: so that for auoiding of these inconueniences, I would wish them to vse the Equinoctiall dials. And furthermore, I do thinke that the Equinoctiall dials be not vsed amongst our Mariners here in England, for that the charges is so much in the making of them, & yet it serueth no other turne but to know the houre of the day, & to shew the true shadow of the Moone. I haue not known them vsed by any English maister or Pilot, but only by one man, which person had it not for the proper vse thereof, but rather had it to say, that he had such an Instrument as no Englishman had ỹ like, and to brag that he had such an Instrument, that he could do great feats therwith in going of long voiages &c. I would haue no man offended with me, I know the nature & qualitie of some that take charge, they will haue instruments and other things thereunto appertaining, & yet they themselues doe not know the vse of them, yet they will séeme to be cunning, and that they néed no instructions of any man, for that they know all things, and yet in respect know nothing. (But notwithstanding) I would wish them that be seafaring men to vse themselues to the Equinoctiall dials, for that they doe serue two notable turnes, as wel at home in these our channels, as also in long voiages, they make them with a very easie charge: for whereas in the Art of Navigation it is shewed how to make them in braße, they make them with wood

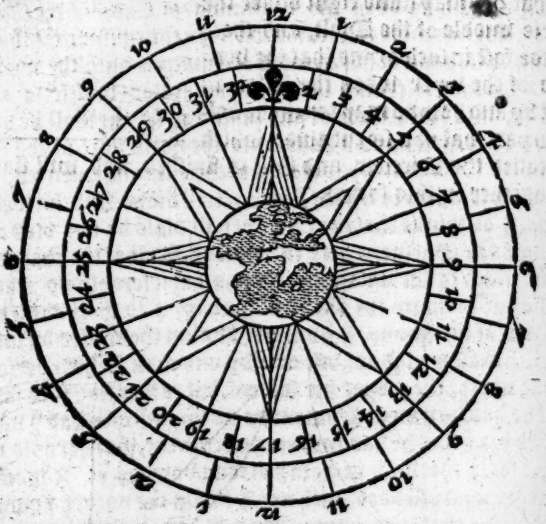
The moone may decline 28. degrees and a halfe from the Equinoctiall.

Of men that will haue instruments and knowy not the vse of them.

An easie way to make an Equinoctiall diall with little charge.

in

in this maner, take a peece of bourds end of fiue inches broad more or lesse at your discretion, and halfe an inch in thicknesse, then hauing cut it round and plained it smoth, you may either graue in it the 32. points of Compasse, or else paint them vpon it, with some colours, with the 24. houres, vpon both the sides as this figure sheweth.

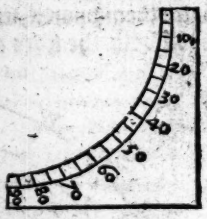


That done, take a wyer of the iust Diameter of the Instrument, then put it through the middle or Center of the Instrument, then make it fast, that the one end be halfe way through on the one side, and the other halfe on the other side: this done, make a frame with three peeces of bourds end, to hang the Diall or instrument vpon, with one pin on the East point, and another on the west point: then take another peece of bourds end being square, and with a paire of compasses strike a quarter of a circle, of iust the bignesse of the quarter of the Diall, and cut all that away, and then the rest

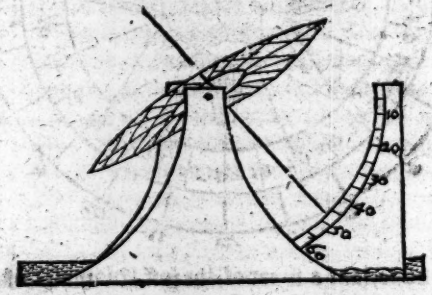
of

of the ſquare that is left (at the edge of the quarter of the circle) diuide in 90. equall parts, marking it thus, 10.20. 30.40.50.60.70.80.90.

As in this forme: laſt of all let this be placed in the middle of the frame, ſo that 90 may ſtand right vnder the verie middle of the Diall, and there made faſt, in ſuch forme, that the very end of the wyer when the Diall is put vp and downe may touch the hollow part that you ſée cut away, which is called the Directer, and ſo it is finiſhed, and will ſtand altogether in this forme.



The Equinoctiall Diall.



The vſe of this Diall is moſt neceſſary in a Shippe, for that you haue occaſions to tranſport your ſelues into all the climates. And to know the true houre of the day, doe this: Set this Diall by your Compaſſe, (the directer vnto the Southwards) and then (you knowing how high the Pole is aboue the Horizon) let the end of the wyer right againſt that degrée, in the directer, and the other end of the wier will point iuſt vnto the Pole, then take what ſhadow the wyer doth

the wier doth giue by the Sunne, that is the true houre of the day. In like manner you may know the true houre of the night by the Moones shadow, and also the Moone will giue a true shadow of her place, &c.

The 22. Chapter treateth of the soundings, comming from any place out of the Occident Sea, to seek Vshant or the Lyzard, and so all alongst, till you come to the coast of Flanders: with other necessarie matters to be knowne to them that be Channellers, that doe occupie or deale among sands, bankes, or such other like.

BEcause it is necessarie to be had in memorie, for that it is a dangerous place to hit or fall with, to enter into the seene, comming homewards out of Spaine or Portugall, or from Barbarie, or any other place from the Southwards, a Ship that commeth from any such place to seeke the Ile of Vshant, or the Lyzard, in this route of sounding of a 100. or ninetie fadames shall finde big soundings, and shall be neere about to the seames. In the rote of eightie fadames you shal finde cockle shels and dents in the tallow of the lead: and in this sounding holde on your course to the North, till you change sounding, then if you be at 60. or 64. fadame, you shall finde small sand and Mathey ground, and shal be neere the coast of Vshant. If you haue time and day, go seek it in the Northeast, and you shall be about 10. leagues from the Ile. If you come making your course about East & by South, you shall finde course sand, red and browne, and you shall haue sounding at 40 fadame: if you be towards the banke of Silley, you shall haue soundings, at 86. or 90. fadame, and you shall find in the tallow stonie ground, and shall be well shot towards the banke of Silley. When you be at eightie fadame, you shall find small black sand and shall be well towards the Lizard. When you be at sixtie or 64. fadame, you shall find white sand and white soft wormes, and shall be very nigh to the Lizard. Betweene the Cape of Cornewall

The Sounding neere vnto Vshant and the Lyzard.

and Vshant amid the Channell you shal find 17. fadame and neere inough. Betweene Dodmon & the Fozne, in the channell you shall haue 40. oz 50. fadame. If you be thwart of Plimmouth oz the Start, you shal find streamie ground and dents in the tallow and soundings 41. oz 42. fadams. At the comming from Poztland you shall haue 35. fadams, & small thingels. And when you be nigh to Poztland 30. fadams, stones like beanes, and this sounding will last till Saint Aldam, and in the said sounding you shall find white stones like broken Anles, and other that be bigger, and then you shall be thwart of Saint Aldam, oz of the Ile of Wight.

The sounding in the Channell.

Two oz three leagues from the Ile of Wight, you shall finde 25. fadame, with dentes and clefts in the tallow like small threads, two oz three leagues from the Caskes, you shall finde 40. fadame, and big stones ragged and black. Betweene the Ile of Wight and the Hag, the depest is but 35 oz 40. fadame. Betweene the Ile of Wight and Lantargate, the depest is but 25. oz 30. fadame. Betweene Beachy and the Ile of Wight a league from the land, you shall find 38. fadame, and Poppel as big as Beanes. Betweene Fairely and the water of Somme in the depest, but 24. fadame. Betweene Folstone and Wolaene, is a banke that is called Rippe rap, and lieth in the midway betweene Picardie and England, & hard a boyd by it, is 26. oz 27. fadame. In the straight of Calyce is 30. fadame, in the Rode of Calyce is 16. fadame. And alongst the coast of Flanders is but 20. fadame, the depest. Thus much haue I said for the entrance of the Sleeue, to come to the Riuer of Thames, and in the entrance in the midway betweene Vshant and Lizard, the Pole Arcticke is elevated 50. degrées and a halfe, & the Equinoctiall is lifted aboue the Horizon 39. degrées and a halfe, And furthermore, for them that are Channellers and occupiers amongst sands and bankes, & such other like, they must haue consideration of these things following. As this: first, if you know how the Channell doth lie right betweene any two sands: you must view the land to take some marks

The height of the Pole at the entrance of the Sleeue.

Necessarie things to be noted for them that are Channellers and dealers amongst sands.

of

of it, to be a leading marke. And that you shall do thus, loke some thing that standeth farre into the land, that you may know it well, being right open with the Channell of the sands, then take another marke nére vnto the waters side, and the one to be right against the other, when that you be in the middle of the Channell: and then you knowing these two markes well, they will be leading markes vnto you for euer to kéepe that Channell.

And then furthermore, if it doth so happen that the Channell doth turne to kéepe another course, or else (some other danger lying in that way) you must haue a thwart marke, to know both when that you are cléere of any danger, & also when that you are open of another Channell, and that you shal do as before is declared, to take some marke within the land, and also another nére vnto the sea water, or riuers side to be your thwart marke when you bring them both together. And this is most specially to be noted: that these marks be very yare, and good when the one is far distant from the other: and those markes very slow and asketh some distance in sayling to open and shut them which are nére together vpon the land. And furthermore, for them that are Channellers or occupiers amongest sands, for that the weather is not alwaies cléere, when they haue occasion to passe through such places, it is good for them to sound the Channels perfectly, and to know by the depth, what side of the Channell they are vpon, and also how farre they are shut into that Channell. And also in like manner to know by the sounding of any of the sides of the Channell, whether they be nére any of the sands or dangers, or any breach off: for that some sands or dangers there be, hauing faire or good soundings or shaldings, that they may borrow off & on at their pleasure. There be againe some sands or daungers, that there is no borrowing or sounding of them, and those be neall or dépe hard vnto the sandes or daungers: for that the water is dépe hard vnto the land: and these are very daungerous sandes for any ship to come nére, for that they shall haue

the water very depe, and by and by be a ground. Yet furthermore, it is very good for them that be Channellers and occupiers amongst sands, to know which way the tide doth set at euery time of the tide: for that many times it happeneth so, that when the sands be vnder the water, the tide doth set crosse the Channell, which is a dangerous matter if it be not very well considered by the Maister or Pilot, &c.

The 23. Chapter is as touching the variation of the Compasse, called the Northeasting and the Northwesting of the Compasse: and how to giue a guesse to know the Longitude.

Of the Compasse to vary to euen proportion.



AS touching the variation of the compasse, called the Northeasting or Northwesting, it is supposed that the compasse doth vary by proportion, in the sayling to the Eastwards or westwards: if it varieth by proportion, that the north point is varied one point from the North, at 22. degrees and a halfe and so vntill the North point doth stand Northeast or Northwest. And that is, when you are 90. degrees from the Meridian that the compasse was made at, to the Eastwards or Westwards. Some also are of another opinion, that the compasse doth vary by no proportion, but doth vary according vnto the nature of some kind of Minerals, that is, in some countrey, or some kinde of Ilands that draw the compasse by the mines of the Loadestone, or Magnes stone, that they touch their compasse with when they make them. And furthermore, the booke of Martin Curtise, called the Art of Nauigation, saith, that the Compasse doth vary by proportion in this manner: which is by the proportion of a Circle, for that the North point doth alwaies point vnto a place in the heauens that is vnmoueable, and

Of the Compasse to vary by no proportion.

Of the Compasse to varie according vnto the proportion of a circle that is, swiftly and slowly.

and therefore as you do transport your selfe to the Eastward or Westward, the North point doth still point vnto that place in the heauen: wherefore (as he saith) when you be 90. degrées in Longitude from the place that the compasse doth stand due South and North, that is, when you be one quarter of the circumference of the earth, in that Parallel the Compasse will be varied foure points from the North: & as you do transport your selfe further, then the North point of the compasse will come nérer and nérer into the north: and when you are iust halfe the circumference of the earth, that then the North point will stand due North vpon the Pole againe, for that you are come to the same Meridian againe vpon the opposite part of the earth (as it doth appeare in the third part, & fift Chapter of the said booke of Martin Curtise:) but if that be true, then the compasse doth vary swiftly at the first, and slowly afterwards, in order like vnto the Suns declination: by which they may very well know by what order the Compasse doth varie, & so by the variation: you may giue a nére estimation of the Longitude, and know in how many degrées the Compasse is varied one point, two points, three points, or foure points, which is the greatest variation. Now to know the proportion, do this: First, make a circle with a payre of compasses, and strike a line by the Center to the circumference, which shall be your Meridian line, then strike another line by the Center a crosse, that you may diuide the circle into foure equall parts, and then because 45. degrées is the greatest variation, set 45. vnto the East part and West part, diuiding euerie one of the quarters of the circle into 45. equall parts, according to the greatest variation: then make another circle of that Diameter, that the circumference touch that Center of the circle, & diuide it as you diuided the compasse, after the rate of 32. points, although you néd not to diuide but that side to the Northwards, and then the Northeast & Northwest point will fall vpon 45. degrées: that done, draw lines according to the points of the compasse vnto the Eastwards or westwards, and loke how

To know in how many degrees going vnto the Eastward or Westward, that the compasse doth vary one point or three points two points, &c.

they fall vpon the line that commeth from the Center of the other circle: of which euery quarter is diuided into 45. equal parts, and then (at the very place that the line doth touch) draw Parallel lines in the circle by proportion at euery place to the Eastwards or Westwards, that the line of the compasse falleth vpon: and that will shew you iustly how many degrées you shall transport your selfe vnto the Eastwards or Westwards for the varying of the first point, second point, and third point: and in like manner the greatest variation, which is the fourth point. So that (according to that order) it will fall out in this manner, that the compasse will be varied one point at nére eleauen and $\frac{1}{2}$. It will be varied two points nére about 24. degrées and a halfe.

To know how many degrees is in the varying of one point.

It will be varied three points at 42. degrées and about a halfe. But it will not be varied the fourth point vntil you be 90. degrées from the Meridian that the compasse was made at: which is a very slow varying, being 47. degrées & $\frac{1}{2}$ before the compasse doth vary one point, and betwéene the third point & the second point, being 18. degrées for the varying of that point, & then from the second point vnto the first point is 13. degrées and better, and last of all from the varying of one point to the Meridian it is eleauen degrées and $\frac{1}{2}$ part, euery degrée being according to that Parallel you are in, which doth alter according vnto your Latitude from the Equinoctial, for vnder the Equinoctiall it is 60. English miles or 20. English leagues vnto one degrée. In the Latitude of 60. degrées from the Equinoctiall, there in that parallel it is but 30. miles or 10. English leagues vnto one degrée, &c. As it is plainely shewed in the 16. Chapter of this booke, wherein is an instrument shewing you how many miles of Longitude wil answer vnto a degrée in euery seuerall Latitude by the applying of a thread at your discretion: So that I conclude, if the compasse doth vary by that order of proportion that Martin Curtise doth attribute vnto it, you may giue a néere gueese to find the Longitude by the varying of the compasse, being nére vnto the Meridian in which the

If you will know how many leagues a degree is, repaire to the 16. Chapter.

compasse

compaſſe doth ſtand due ſouth & north: but if you be very far from the Meridian that the compaſſe was made for, then the variation is ſo ſlow, that you can haue no iudgement at all (by the variation of the compaſſe) to find any Longitude.

And furthermore, if the compaſſe doth vary by that proportion that Martin Curtiſe doth affirme, I am of that opinion that there may grow ſome errour in proportion in thoſe compaſſes that are made for any Meridian: for thoſe compaſſes that are made here with vs in England, whereof the néedle doth ſtand foure or fiue degrées vnto the Eaſtwards of the North, (as doth appeare by all the néedles made for Dials, and alſo of the compaſſes) if they would haue the North point to ſtand due North, then the end of the wyers vnder the Carde of the compaſſe ſhould ſtand foure or fiue degrées vnto the Eaſtwards of the Floure-deluce: wherefore it may be doubted, that the compaſſe may vary more the one way then it will the other way, by that proportion that the end of the wyer doth ſtand from the North point. For (if in the greateſt variation) the end of the wyer (vnder the Carde of the Compaſſe) doth ſtand Northweſt, the Floure-deluce of the Compaſſe ſhould ſtand néere halfe a point to the Weſtward of the Northweſt. There may grow ſome error in the proportion of the varying of the Compaſſe.

And in like manner at the greateſt variation, if the end of the wyer doth ſtand Northeaſt, then the Floure-deluce ſhould ſtand néere halfe a point vnto the northwards of the northeaſt, &c. Wherefore the compaſſes that were deuiſed by Norman, are very good to reforme theſe cauſes. But this cauſe is very ſpeciall, to giue a néere gueſſe of the longitude, that is to ſay, the compaſſe will vary more quickly (according to the order before written) by which you ſée they may tranſport themſelues further into the Eaſtwards or Weſtwards, before that the compaſſe doth varie one point, then it doth for the other three points, ſo that they are not able to giue any eſtimation at all, by the varying of the compaſſe to know any Longitude: for that they may trauaile more then the quarter of the circumference of the earth, before the compaſſe Of ſlow varying of the Compaſſe.

passe will be varied one point backewards and forwards.

Of making notes of the variation.

And furthermore, it is very good for them that are Masters or Pilots of ships, to note, when they do fall with any land where the compasse is varied, to make a remembrance in a booke, how many points and degrees the compasse is varied in euerie place where they came vnto, which will be a great help for them to finde that place againe. And to finde the variation, it is declared in the first Chapter.

A Hydrographicall discourse, to shew the passage vnto Cattay fiue manner of waies, two of them knowne, and the other three supposed, wherein you shall know the distance of Cattay, and also by what points or winds of the compasse that you shall saile for the attraining thither, and also the rest of the East Indies.

Whereas it hath bin oftentimes in question of late yéars now in this our age, for the discouerie for to find out a way to come vnto Cattay, China, and the Ilands of Moluccas, with other places in the East Indies: I haue thought it good to write this Hydrographicall discourse, to goe to Cattay fiue manner of waies, for that there are some people that are doubtfull whether that there be any such place, other some are doubtfull that there is no passage thither.

So some holding one opinion and some another, I haue taken vpon mée for to shew vnto them the passage to goe vnto Cattay fiue manner of waies, whereof two of them are knowne, and the other three supposed.

Wherein I haue set downe particularly the courses, that is to say, by what point of the compasse that you must saile, and all the distance, what number of leagues that it is from place to place, hauing perused the best Cosmographers, and for that wée haue no Charts or Plats Hydrographicall, that

that doth shew the true course and distance, it is possible it that is not exactly true, but onely to glance somewhat nér the matter: therefore you must not lok to haue it so certaine that there is no erro in it, neither am I assured that it is altogether vntrue, either in the dstance o course, but that you may haue some aide by this, &c.

To goe vnto Cattay that way that the Portugals doe goe vnto Calicut and the Ilands of Moluccas, which is about by Cape bone Sperance, after that thou art departed from the Lizard o Cape of Cornewall, being the Westerne part of England, you must make your direction from thence vnto the Canarie Ilands, hauing Latitude twentie eight & a half, the course is nére the South Southwest about 500. leagues.

And on the starre bord side is the West Ocean sea, and on the Larbord side, first the coast of Fraunce, then the coast of Spaine and Portugall, and then the coast of Barbarie in Africa, &c.

From the Canarie Ilands you must set your course vnto Cape de verde in Ginney, the Latitude thereof is nére 15. degrées, and the course is South about 270. leagues, and on the starbord side is the West Ocean Sea, and on the Larbord side the coast of Barbarie and Ginney: from Cape de verde you must goe vnto Cape Palmas, the Latitude is nére foure degrées, and the course is South and by East, about 130. leagues, on the Starbord side is an Ocean sea, & on the Larbord side, the coast of Ginny. And from thence make your direction to Cape bone Sperance, being the southermost part of all Æthiopia, forsaking the coast, & making your course through the sea, the course is nére the South-east and by South, 1060. leagues, and the Altitude of the Antarcticke pole, is about 35. degrées aboue the Horizon, and on the Starbord side is Brasile in America, and the great River of Platte, and on the Larbord side is the coast of Castill de Mine, in Ginney and Binney, and the coast of Æthiopia, &c. But if that you will kéepe the coast of Ginney, then being departed from Cape Palmas, goe vnto the Iland

of

of Saint Thomas, your course is East and by South, neere fiue hundred sixty leagues, and the Iland of Saint Thomas hath no Latitude, for that it is directly vnder the Equinoctiall: and on the starboord side is the Ocean Sea, and on the Larboord side is the Coast of Castel de Mine, and the Coast of Binney, &c.

And from the Iland of Saint Thomas, vnto Cape bone Sperance, the course is south and by East, about seauen hundred fifty leagues, and on the starboord side is the Ocean sea, and on the Larboord side the coast of Æthiopia: from Cape bone Sperance, you must set sayle vnto the great Iland of S. Laurence, namely to the Westermost part of the Iland, and that hath latitude toward the Antarcticke Pole, aboue 28. degrées, and the course is from Cape bone Sperance, Northeast and by East, about 550. leagues, on the starboord side, is the vnknowne land that lyeth towards the Antarcticke pole, & on the larboord side the Coast of Æthiopia and the length of the Iland is about 360. or 400. leagues, and the longest way of the Iland doth lie East Northeast, and West Southwest, and is from the mayneland of Æthiopia about eightie or 100 leagues, &c. Furthermore by the way, I do think it good for to shew the course and distance vnto the red sea, and also the course and distance vnto Calicut. To set out your course from the Easternmost end of the great Iland of S. Laurence, which hath the Antarcticke Pole raised 13. degrées, towards the straights of the red sea, the course is North & by East about 470. leagues, and the latitude of the straights, is about 10. degrées, towards the North Pole. and these straights are greatly occupied, for that all the spices that serueth the Turkes dominions, and also some parts of Christendome, is brought from the Iland of Moluccas and other parts of the East Indies, as Calicut, and such like places, and so by shipping transported into the red sea, & so put on land in Ægypt and carryed ouer a little part of the land, and then they are newly embarked, and brought downe to the great River Nilus, and put a land at Alexandria in Ægipt,

Ægypt, that is a Port, in the midland sea, and from thence they are transported by shipping vnto a number of places both in the Turkes dominions, & other places Christned, &c.

From the straights vnto the hether end of the red Sea in Ægypt, the course is for the most part Northwest and North Northwest, about nére 500. leagues. And going into the red sea, the starboord side is the coast of Arabia, and the Larboord side is first the coast of Æthiopia, and then the coast of Ægypt, &c.

And also if that you will goe from the East end of the great Iland of Saint Laurence, vnto the famous Marchant towne called Calicut in Indie, then your course is Northeast and to the Eastwards about 860. leagues, and the latitude is fiue degrées to the North parts, and on the starboord side is the Ocean sea, and the Larboord side is the coast of Æthiopia, and straights of the red sea, and the coast of Arabia, and the straights of the Persian sea, and the Iland of Ormes, &c. But if that you will hold on your course to go vnto Cattay, then from the East end of the great Iland of Saint Laurence, to the great Iland called Traprobane, your course is East Northeast, or East & by north about 1100 leagues, but it is possible, that in these courses, you may méete with a number of Ilands, for that all this East Ocean sea is very full of great and small Ilands, and the middle of this great Iland lyeth directly vnder the Equinoctiall, and the length of this Iland is nére 300 leagues, and on the starboord side is the vnknowne lands, towards the Antarcticke Pole, and on the Larboord side the straights of the redde Sea, Arabia, the Iland of Ormes, the Persian sea, Calicut, and the great riuer of Ganges. And now for to depart from the great Iland of Traprobane, to goe vnto the great Iland of Gilolo being the greatest Iland amongst all the Moluccas, the course is East about one thousand leagues, but there lyeth a number of Ilands in the way, and on the starboord side is the Iland of Iana and Borneo, and on the Larboord side, the greatest heape of the Moluccas Ilands. The Iland of Gilolo

hath

hath no Latitude, for that it lyeth directly vnder the Equinoctiall from the Iland of Gilolo vnto the Coast of China, the course is North and by West, about 500. leagues.

The Latitude of China is about 25. degrées, and on the starboord side is the south sea, and America, and the larboord side is the Ilands of Moluccas: but for to goe from the great Iland of Traprobane, the next way to China, the course is Northeast and by East 1000. leagues, and then on the starboord side, you shall haue all the Moluccas Ilands, and on the Larboord side the maine land of Asia or East India, & then from the Coast of China, vnto the great Bay of Quinsay in Cattay, the course is North and by East, about 100. leagues, and the entrance of the Bay of Quinsay, the Latitude is 35. degrées, and on the starboord side is the firme land of America, and the great Iland of Iupan, and the Larboord side the coast of China and Cattay, &c.

Now thus much haue I said as touching the way to come out of England to goe vnto Cattay, and East India, hoping that the reasonable Reader will not enuy me, for this vsing my discourse, neither you must not looke so exquisitely vnto it, for that it cannot be the exact truth: for as I doe suppose that no English man hath séene any true Chart or Plat of all the the East India, wherefore I doe suppose that you will beare with this my discourse, &c.

And now furthermore as touching this discourse for to come out of England to goe vnto Cattay, the second way, and that is known that the Sea will let them haue passage, that is to say, through the straights of Magellane, & so into the South sea, as this, first to make their direction from the West part of England vnto the straights of Magellane, although that indéed there can be no long passage by Sea, but that the ships are to séeke some places for to water at, and other easements, yet notwithstanding I doe meane to make but one direction for course from England vnto the straights of Magellane, for that the Master or the Pilots may séeke their watring places most best for their purposes, &c.

From

From the Lizard vnto the ſtraights of Magellane, the courſe is for the moſt part South ſouthweſt and to the weſtwards, about 2400. leagues, and the Latitude of the ſtraights is 52. degrées and a halfe towards the Antarcticke Pole, and on the ſtarboord ſide is the firme land of America, and the Larboord ſide Europe and Africa, &c.

And through the ſtraights, the courſe may be Weſt or Weſt Southweſt 100 or 140. leagues before that they be clérely in the South ſea; and now being into that ſea, they may goe either into Cattay or the Moluccas, or the Port of Pannama, that is, the place where the King of Spaine hath all the treaſure that commeth from Peru. And from thence it is carried by a certaine riuer, and tranſported ouer the necke of a land, and then imbarked and brought downe another Riuer, and ſo landed at Nombre di dios, and from thence tranſported by ſhips into Spaine, &c.

Being through the ſtraights of Magellane, if that you will go into the Port Pannama, then your courſe is for to goe North northweſt, or northweſt and by North, or North and by Weſt, as the land will giue you paſſage, for that there hath not bin made any true Plats for that coaſt in that ſea, and doth containe in leagues from the ſtraights vnto the port of Pannama, 1100. or 1200 leagues. But if that you will goe from the ſtraights vnto Cattay, as it is a ſea that is not vnto the South parts néere the ſtraights well known, ſo there may lye many Ilands in that Sea that you may méete with, and alſo there may be rockes and dangers there in like manner that are not known, but the generall courſe is Northweſt vnto Cattay or China, about 2800. leagues, hauing on the Starboord ſide the maine land of America, & on the Larboord ſide the vnknowen land that lyeth towards the Antarctick Pole, and alſo the Ilands of Moluccas, and Calicut. And thus much haue I ſaid as touching the paſſage vnto Cattay, by theſe two waies that are knowne. But here is one thing to be noted, for (as it hath beene reported) the Portugalls Carickes going vnto Calicut, when that they

they be at Cape bone Sperance, then they do not directly set their course the next way, but stand South ouer towards the land that lyeth to the Antarctike Polewards, and the cause thereof is the great Current, that is at Cape bone Sperance, continually running from the East into the west, and when that they haue gone a hundred or a hundred and fiftie leagues vnto the southwards of the Cape, then they set their Course for to go with Calicut, so that outwards they do not come nére the great Iland of Saint Laurence, but goe a great deale to the southward of it, for that they will not be let by the great currant: But when they doe come homewards, then they doe come hard by the Ile of S. Laurence, and so directly with Cape bone Sperance, for that they will haue all the help that they may with the Current, then they goe west Northwest into the Sea with the maine land of America, till that they be halfe that Sea ouer, and then they do set their course to goe homewards, as it is not vnknown, that when the Spanish Fléte doth goe outwards to the West Indies they do goe vnto the Canaries, and so west into the Sea, and so hold in by the south land of the Bay of Mexico, for that they haue some help by the Current: but when that they doe come home, then they doe come by the Northland of the Bay of Mexico, betwéne the Iland of Cuba and Terra Florida, for that they will haue the Current homewards to help them. Also it is reported that in the straights of Magellane that the Current runneth continually from the East into the West. Now thus much haue I said, as touching the two waies vnto Cattay, for that there is knowne that there is passage by Sea, if that it were attempted, although the passage is very long, &c.

The third way, that is not knowne, but supposed that it may be passageable, is by the Northwest, the which of late Captaine Forbisher hath begun to enter into, & hath discouered it as far as a place now called Meta Incognita, which he himselfe did cal Forbisher Straights, but yet notwithstanding it is doubtfull, whether that be a straight to giue passage

sage to come into the East Ocean sea, or South sea, for any thing that is knowne yet, it may be as well a Bay as otherwise, but notwithstanding whether that be a straight or not, it is possible that there may be passage there about, betwéne the Norther part of America, as betwéne Labradore and Gronland, and such lands as lye toward the North Pole.

Wherefore now for to depart from England to goe vnto Cattay by the northwest, first in making your direction from the West part of England, vnto the place called Meta Incognita, the course is West Northwest about 650. leagues, and the Latitude thereof 603. degrées, and on the Starbord is first Ireland and Iseland, and Freeseland, and on the Larbord side, is the Ocean sea. Being at Meta Incognita, you must discouer there abouts, where that you may find sea for to giue you passage, and yet if you do find sea, you must hold on your course West vntill that you haue passed one thousand, or one thousand one hundred leagues. For if that you should hold on any southerly course, you should imbay your selfe in the maine land of America, for the extention of the backe side, or North side of America, is not much lesse then 1000. leagues, before that you shall open the way into the East Ocean sea, and in this West course on the starreboord side is the North Pole, and such lands as lye that way if there be any, on the Larboord side, is the maine of America, &c. And after that you haue sailed west 1000. leagues on the North part of America, you may then direct a more southerly course, because then you may be open of the East Ocean sea, for the most part of the best Cosmographers lay the opening of that sea opposite vnto vs in our Meridian, and then holding on a southerly course, you may hale vnto the great Bay of Quinsay about 400. or 500. leagues. And the Latitude of the North part of the Bay of Quinsay in Cattay is about forty fiue degrées, and on the starboord side is the coast of Asia, as Mangie and Cattay, and on the Larboord side America. And thus much haue I said as touching the third way to go to Cattay, &c.

The

The fourth way to go vnto Cattay, not knowne but supposed, is by the Northeast part, or north part of Russey, about by that way that Master Burrowes began the discouerie, about by a land that is called Noua Zembla, which is a country or point of a land that extendeth to the Northwards, it is not knowne how farre, and yet it may be possible that it is nauigable that waies if it were attempted.

I will a little vse my discourse concerning the passage that way vnto Cattay. The way and distance vnto the North Cape in Norway is not vnknowne vnto a number of Seamen, the Latitude thereof is 71. degrées twentie minutes, therefore I doe thinke it best to begin the direction and setting out of the course East, vntill that they doe come to the land of Noua Zembla, and then falling with that place they are to make their discouery as the land will giue them leaue, and so in this direction it may be possible that they may find a Sea to giue them passage. It may be also that when they may méete with land, they shall be constrained to goe Northeast or North Northeast, vntill that the North Pole be raised eightie or eightie fiue Degrées, yet they may hold on their course, vntill such time as they shall be incombred with Ise, for it may be so, that in Latitude of eightie degrees, there shall be no Ise, although that on the Coast of Baccalaos, you may haue Ise, in the latitude fiftie degrées, for no man can tell vntill such time as he hath made experience, and now in this passage vnto the Eastwards from the North Cape vntill that they shall haue the Sea open to come into the Southwards in the Sea of Cattay, it may be about one thousand, or 1200. Leagues, and then in this passage on the Starre boord side is first Norway and Lapia, and the Bay of Saint Nicholas, and the great riuer of Ob and Noua Zembla, and the East part of Asia, and on the Larboord side the North Pole, and those lands that lye that waies if there be any, and now in the following of the Coast of the land which may be Southeast, or South Southeast, or South, it may be fiue hundred or 600. Leagues vnto

the

the Bay of Quinſay in Cattay, and on the ſtarboꝛd ſide is Aſia and the coaſt of Mangie and Cattay, and on the Larboꝛd ſide the maine land of America, &c.

And furthermoꝛe, it may be poſſible foꝛ to find paſſage foꝛ to go to Cattay, betweene Noua Zembla, and the countrie of Samwetes, thꝛough the ſea of Vagates, and this paſſage may be ſomewhat ſhoꝛter, then foꝛ to go vnto the Noꝛthwards of Noua Zembla, and then you ſhall haue in this paſſage vpon the ſtarboꝛd ſide, firſt the countrie of Samwetes, as Pichora, and the riuer of Ob and Tartaria, &c. And on the Larboꝛd ſide, Noua Zembla, &c.

And thus I do end as touching the Noꝛtheaſt paſſage to goe, oꝛ to attaine vnto Cattay the fourth way, &c.

As touching the fift way to goe vnto Cattay, it may be that in my diſcourſe it may ſéeme a méere fooliſhneſſe and a thing vnpoſſible foꝛ it to be done, and yet notwithſtanding no man can tell, befoꝛe that it is put in experience, and yet it is the neareſt way if that it be nauigable, and my meaning is this, foꝛ to go directly vnto the Pole, if ſo be that there be no land to let the paſſage. Now it is poſſible that ſome will ſay that it is the frozen Zone, but notwithſtanding if that there be not land that way, then it is not frozen, foꝛ the great ſalt ſea neuer freꝛeth, & whereas you do ſée the great quantitie of Iſe on the coaſt of Labradore and Bacalayas, it is a token that there abouts is much land towards the Noꝛth Polewards, and ſo is frozen in ſounds and riuers, and in the bꝛeaking vp of the yéare, it doth come dꝛiuing out to ſea: foꝛ in reſpect they do ſeldome ſée any Iſe at the Noꝛth cape, noꝛ 100. leagues Noꝛth off from thence, it is a great token that there is no land towards the Pole-wards, and beſoꝛe that it hath béene put in pꝛoofe it cannot be knowne.

But all the doubts foꝛ going vnto the Pole-wards, are foꝛ feare of too much cold, & yet notwithſtanding it may be reaſonable warme right vnder the Pole, foꝛ any thing that is knowen vnto the contrary, by the long continuance of the Sunne in Summer, foꝛ that in the time of nine weekes, the

Sunne is neuer leſſe than 20 degrées abone the Horizon going round about them, ſo that the continuance of the Sun muſt enforce the ayre to be reaſonable warme, eſpecially if that there be no Ile driuing in the Sea, for it is not ſo cold at Meta Incognita, if that they be not amongſt the Ile: for if that they be at Sea and not amongſt Ile, then it is very warme, and alſo if that they be a ſhore, then it is warme in like manner, ſo that the cold is cauſed by no other meanes then by the cold breath or aire that commeth from the Ile. And now to proceede: to goe vnto Cattay, you muſt goe directly North, till that you be right vnder the Pole, and then goe South to the oppoſite part beyond the Pole, which may be done if that you be not let by any land that lieth in the way. The whole diſtance in this courſe from the riuer of Thames vnto the Bay of Quinſay, is but 1680. leagues, which is a very ſhort way in reſpect of the other. But now it is poſſible that ſome will make argument and ſay, that it is not poſſible for any man to make any direction, or ſet any courſe being directly vnder the Pole, for that it is not known which way that the Compaſſe will ſtand, and alſo in like maner being vnder the Pole, all places is South which way ſoeuer you goe, and alſo the Sunne is equally one height, ſo that you can make no proofe which way is forwards, and which way is backwards: therefore it is to be ſuppoſed, that ſome will ſay, that it is not poſſible to make any inſtruments to aſſigne any courſe to any place appointed: for truth it is, that being vnder the Pole, any place aſſigned is ſouth from vs, what quarter of the world ſoeuer wée are in, and if that the Sea will giue vs paſſage, our courſe is ſouth to go vnto it, &c. Yet notwithſtanding, I will ſhew vnto you what you ſhall do to make a perfect direction vnto any place appointed being right vnder the Pole, ſo that you ſhall know whether you doe goe backwards, or forwards, or any other way that you ſhall appoint, ſo that you may ſée the Sun, and that muſt be done thus. Firſt, prepare a perfect good clocke,

that

that goeth with a Spring, the which clocke muſt be made in that order that the directer or pointer may goe round in 24 houres, and it muſt ſo be marked that it may end 24 houres at nowne, and then to begin one, this clocke or Diall being well made, and keping the time truely, when that you doe approach nére to the Pole within one hundred leagues, that is the Latitude of 85. degrées, (for ſo far the Compaſſe may ſerue, and alſo you may correct the compaſſe well inough, for that the Sun is ten degrées higher on the South part, then it is on the North part) and now being within fiue degrées of the Pole, ſet your clocke to worke, and let the 24. houre be nowne, and then when that you are directly vnder the Pole, loke if that the pointer doth ſtand vpon the 24 houre, then that part or quarter that the Sun is in, is right backe againe, and if that it point 12. houres, then towards the Sun-wards is right forwards, and if that it point fiue houres, then the part of the world towards the Sun is one Weſt from you, and is one quarter of the earth, that direction will ſet you right vpon it, and if 18. houres, then towards the Sun doth appoint you that place that is Eaſt one quarter of the earth, &c.

And now for to ſet any courſe to ſtirre the Ship vpon to any place appointed, note this for an enſample, I would go directly homewards, and then I will ſet the Flie of a Compaſſe before him that ſhall ſtirre: and for ſomuch as I come out North, and I muſt goe home South, I lay the Card or Flie ſteadie before me, and the South point right with the ſhippes head or ſtemme, and ſo I do ſet the Clock by it, now if that the Clocke doth point twentie foure houres, for that afore was by nowne, then I doe ſtirre the Shippe right vpon the Sunne, and if the clocke doth appoint three houres, then hee that doth ſtirre muſt kéepe the Sunne vpon the Southweſt, and ſo ſhall the Ship goe that South that thée came from, and if that the clock doth point fiue houres, then hée that doth ſtirre muſt kéepe the Sunne vpon the Weſt

point, and if the clocke shew 9. then kéepe the Sunne vpon the Northwest. If the Clock doth shew 12. then the Sunne must be on the North point, that is right with the sterne of the ship. And if the clocke doth shew 15. houres, then he that sterreth must kéepe the Sunne vpon the Northeast point, if 18. then must he kéepe the Sunne on the East point, and if 21. houres, then on the Southeast point, &c. But now if that you would goe directly forwards, then lay the North point right with the shippes head, and when the clocke doth point 12. then sterre right vpon the Sunne, and so in like manner must you sterre by the Sun as I haue afore shewed you by ensamples, so that you may sée by this Clocke or Dial, how you may assigne your selfe to kéepe any course into any place in the whole world, you being vnder the Pole, and then when that you are departed from the Pole 100. leagues, that is 5. degrées, then you may vse your compasse, and correct it by the Sun at your pleasure. And thus much I haue said as touching the passages to goe vnto Cattay: wherefore gentle Reader beare with my rudenesse, for that I am so bold to vse my discourse vpon the passage vnto Cattay. And furthermore, some men haue bin of that opinion, that when that they are in the East Ocean Sea, that they shall méete with no shipping, as about Cattay and China, &c. But notwithstanding it is a sea wherein there is a huge number of Shippes both great and small, for whereas there is such great trade of Marchandize, and also such a number of Ilands both great and small, and also such a number of commodities in those Ilands, any man may iudge that it is likely that there is great store of ships, and also ordinance in their shipping, &c. And it is not vnknown but that the great Cane of Cattay, is a Prince of great power, as well by Sea as by land, then iudge you whether that such a Prince of such a force and wealth will not prouide for all things méete for wars. Therefore as soone, as they come into those Coasts they must orderly vse the trade of Marchandize, and not

vse

ble force, &c. Moreouer vpon a time I being with Master Dee at his house at Murclacke, and falling in talke about the discouery to Cattay and the shipping there abouts, thereupon he opened a booke and shewed me a note what number of shippes the great Cane had ready at one time to goe vnto sea about his affaires, you would think it vncredible, for the number was 15000. which is a huge armie by Sea: I replied againe that it might be that they were but small things, and yet they might call them Ships, and then he turned vnto another place where the great Cane did send one of his Daughters by Sea, and did appoint 14. of his ships, and the least of the 14. Ships had 250. Mariners, besides all the rest of his Daughters traine and such Nobles as did accompany her, which could be no small number. Therefore it is most manifest that the Cane is a great Prince of power as well by Sea as by Land.

FINIS.

A Table of the declination of the seuerall degrees of each signe, calculated by *T. Hood* according to the greatest declination of the Sunne which is now 23. degrees 28. minutes.

degrees of the signes	Aries. Libra. D. M.	Taurus. Scorpio D. M	Gemini. Sagittarius. D. M.	minutes
0	0 0	11 29	20 10	30
1	0 24	11 50	20 23	29
2	0 47	12 11	20 35	28
3	1 11	12 32	20 47	27
4	1 35	12 52	20 58	26
5	1 59	13 12	21 9	25
6	2 23	13 32	21 20	24
7	2 47	13 52	21 30	23
8	3 10	14 12	21 40	22
9	3 34	14 31	21 49	21
10	3 58	14 50	21 58	20
11	4 21	15 9	22 7	19
12	4 45	15 27	22 15	18
13	5 8	15 45	22 23	17
14	5 32	16 4	22 30	16
15	5 55	16 21	22 37	15
16	6 18	16 39	22 44	14
17	6 41	16 56	22 50	13
18	7 4	17 13	23 1	12
19	7 27	17 29	23 5	11
20	7 50	17 46	23 10	10
21	8 12	18 2	12 13	9
22	8 35	18 17	23 17	8
23	8 57	81 33	23 20	7
24	9 19	18 47	23 22	6
25	9 41	19 2	23 24	5
26	10 3	19 17	23 26	4
27	10 25	19 31	23 27	3
28	10 46	19 44	23 28	2
29	11 8	19 57	23 28	1
30	11 29	20 10		0

Virgo.	Leo.	Cancer.
Pisces.	Aquarius.	Capricorn.

FOR asmuch as it is méete and conuenient for a Sea-faring man to be able to finde out the declination of the Sunne continually, not onely by the help of the Table before set downe according to the day of the moneth, but also according to each seuerall degrée of the signe which the Sunne possesseth, therefore I haue here adioyned a Table of declination, calculated according to the Suns greatest declination, which is now estéemed to be twentie three degrées, twentie eight minutes. The vse of the which Table is as followeth.

First, you must search out by the Ephemerides (for that is best to be followed by the common sort) the place of the Sunne, that is to say, what signe and degrée and minute the Sunne possesseth. Secondly, you are to consider whether the name of the signe which the Sunne possesseth be set at the toppe, or at the bottome of the Table. If it stand at the toppe, you must séeke the degrée of the said signe on the left hand of the Table descending down ward, But if the name of the signe be at the bottome of the Table, you must séeke the degrée on the right hand

hand ascending vpward. Then going on directly from the degrée forward, either towards the right hand or toward the left as occasion requireth vntill you come right against the name of the signe which the Sunne possesseth you shall finde the declination. As for example: suppose the place of the Sunne were the 24. degrée of Aries. The name of the signe standeth at the toppe of the Table, therefore I séeke out the 24. degrée on the left hand, and going on from thence toward the right hand vntill I come right against Aries, I finde the declination to be nine degrées 19 minutes.

Againe, suppose the place of the Sunne to be the 24. of Cancer: I sée the name of that signe to stand at the bottome of the Table, therefore I séek out the 24. degrée on the right hand, and going on from thence toward the left hand, vntill I come right against Cancer, I finde the declination to be 21. degrées 20. minutes.

Thirdly, in the vse of this Table you are to note whether there be any minutes Adherent, & adioyned to the degrées of the signe, which the Sunne possesseth yea or no, as whether the Sunne possesseth precisely the 24. degrée of Aries or the 24. degrée and the 27. 40. or 50. minute, &c. If there be no minutes ouer and aboue the degrées, then the aforesaid Table in such manner, as I spake of before affordeth the declination.

But if there be minutes adioyned to the degrées, then by proportion (otherwise called the rule of three) you must séeke out what declination may belong vnto the said minutes in this manner.

The first number in the proportion must alwaies be 60 minutes (because we argue from a degrée, which is 60 minutes to the parts of a degrée, which are the odde minutes Adherent to the whole degrée.) The third number must alwaies be the odde minutes adioyning to the degrée of the signe which the Sun possesseth: for the question is moued concerning them. The middlemost or second number in the

proportion must be the difference of declination betweene the declination of the degrée, which the Sun possesseth, and the next degrée immediately following according to the naturall succession of the numbers. The which difference may easily be found by the subducting of the declination of one degrée out of another. The second number being found, and all of them being orderly set downe as the rule of thrée requireth, multiply the third by the second, and diuide the product by the fourth, the quotient affordeth the proportionall part answerable to the minutes propounded.

This proportionall part must be added to the declination of the degrée assigned, if the name of the signe stand at the top of the Table, but if the name of the signe stand at the bottome of the Table it must be subducted, so shall you finde the declination of the degrées and minutes. As for example, suppose the Sunne possesse 22. degrées, 22. minutes of Aquarius, what shall his declination be? The first number in the rule of proportion must be 60. minutes, the third must be 22. (for they are the odde minutes adioyned to the degrées (and the second number I find thus, The Sun possessing the 22. degrées of Aquarius declineth 14. degrées 12. minutes, and possessing the 23. of Aquarius hée decineth 13. degrées 52. minutes, the one of these subducted from the other, I find the difference of declination to be 20. minutes, this is the second number in the proportion, whereupon I say if 60 giue 20. what shall 22. minutes giue. The quotient according to the rule, is seauen (the fraction being neglected as the custome is in these matters, because the common forth careth not for the seconds, &c.) And because the name of the supposed signe which the Sunne possesseth, standeth in the bottom of the Table, therefore I subduct the said seauen minutes out of the declination belonging to the 22. degrée, and find the declination of the 22. degrées 12. minutes of Aquarius to be 14. degrées fiue minutes.

Againe, suppose that the Sun possesseth the 16. degrée 25. minute of Taurus, what shall his declination be? The difference

ference of declination betwéne the 16. and the 17. degrée of Taurus is 17. minutes, wherupon I say: If the Sunne in going one whole degrée (that is 60. minutes) doe decline 17. minutes, what shall his declination be in going 25. minutes. The quotient according to the rule is seauen minuts. And because the name of the signe which the Sunne is supposed to possesse standeth in the toppe of the Table, therefore I adde seauen minutes to the 16. degrée 39. minutes, which is the declination of the 16. degrée of Taurus, and therupon inferreth the declination of the 16. degrée 25. minutes to be 16. degrées 46. minutes. Thus much briefely concerning the finding out of the declination of any degrée which the Sunne possesseth.

FINIS.

The

THe first Chapter of Nauigation, sheweth what the 32. points of the Compasse be, and to what vses they doe serue. 7

The 2. Chapter treateth of the Golden number or Prime, shewing the Epact, and by the Epact, to know the age of the Moone. 9

The 3. Chapter teacheth how to know by the age of the Moone, what a clock it doth flow, or is full Sea at any place where you do know what Moone maketh a full Sea. 10

The 4. Chapter treateth of the Sunne and Moones course in the Zodiacke, and how you shall know at what houres the Moone shall rise and set at any and at what point of the compasse, with other necessarie things. 14

The 5. Chapter is a Table of declination, commonly called of Sea-faring men, a Regiment of the Sunne, exactly calculated for foure yeeres, and will serue for 24. yeeres, for euery day of the moneth. 17

The 6. Chapter sheweth how to take the height of the Sunne with the crosse staffe. 27

The 7. Chapter sheweth how to handle the declination of the Sunne, to know the Altitude of the North Pole aboue the Horizon (the height of the Sunne being trulie taken and knowne in any place betweene the North Pole and the Equinoctiall) so that the Sunne be vnto the Southwards of you, at the taking of the same vpon the Meridian. 31

The 8. Chapter sheweth you how to handle the declination of the Sun when you are betweene the Equinoctiall and the Sun, that is to say, the Sun to the Southwards or Northwards of you, and the Equinoctiall to the Northwards or Southwards, or vnder the Equinoctiall, the height of the Sunne being truely knowne or taken. 32

The 9. Chapter sheweth how to handle the declination of the Sunne, when you are beyond the Equinoctiall, that is

is to say, betweene the South Pole and the Equinoctiall, with certaine ensamples both for the South Pole and the North Pole. 34

The 10. Chapter sheweth how to handle the Suns declination vnto the Northward: where the Sunne doth not set vnder the Horizon: and also to take the Sunne at the lowest due North. 36

The 11. Chapter doth shew how you shall know the length of the day, and to know how much the day is shortned or lengthned by the Sunnes declination. 38

The 12. Chapter is of the North starre. 40

The 13. Chapter doth shew you by the falling vpon the quarter of your compasse in how far sailing you do raise a degree, and what you do depart from the Meridian, &c. 41

The 14. Chapter sheweth how to know how farre any land is off from you, if you know the distance betweene any two places, whether that you doe runne alongst by the land, or directly to the shoare, or otherwise, with other necessarie things. 42

The 15. Chapter treateth of the Longitude, &c. 46

The 16. Chapter sheweth how many miles will answere to one degree of Longitude in euery seuerall Latitude betweene the Equinoctiall and either of the two Poles: with the demonstration for that purpose, and also the diuersity of aspects of the Moone. 47

The 17. Chapter sheweth the circumference of the whole earth and the sea, vnder sundry Parallels, whereby that any Sea-man may know what quantitie or part of the earth that he hath sailed or passed, by the number of leagues, and also he may know the alteration of time, &c. 49

The 18. Chapter sheweth how to saile by the Globe. And to know how much the water is higher then the leuell betweene any two shippes on the Sea, which groweth by the roundnesse of the earth.

The 19. Chap. is touching the making of Plates or Cards for the sea, & not to paint their Cards as they do, but rather to

fill

fill the vacant places with other neceſſarie matters, and alſo of three neceſſarie things contained in the Plats or Cards with their vſes. 53

The 20. Chapter is of the Longitude and declination of 32. notable fixed ſtarres, for Nauigation, with tables of their ſhining, and at what point of the compaſſe they doe both riſe & ſet: it hath alſo tables for euery moneth in the yeere, declaring at what time they will be South, &c. Which will continue theſe hundred yeeres without much error. 55

The 21. Chapter ſheweth you the making of a generall inſtrumeat to know the houre of the day by, throughout all the world. 61

The 22. Chapter treateth of the ſoundings, comming from any place out of the Occidentall ſea to ſeeke Vſhant on the Lizard, and ſo all alongſt till you come to the coaſt of Flanders: with other neceſſary matters to be knowne of them that be Channellers, that occupie or deale amongſt ſands, or banckes, &c. 63

The 23. Chapter is as touching the variation of the compaſſe called the Northeaſting and Northweſting of the compaſſe and how to giue a gueſſe to know the Longitude. 64

An Hydrographicall diſcourſe to ſhew the paſſage vnto Cattay, China, and Eaſt India, fiue manner of waies, two of them known, and the other three ſuppoſed: wherein you ſhall know the diſtance vnto Cattay, China, the Moluccas and Calicut, and alſo by what point or winds of the compaſſe that you ſhall ſaile for the attaining thither, and alſo the reſt of the Eaſt Indies. 66

A Table of the declination of the ſeuerall degrees of each ſigne calculated by *T. Hood*, according to the greateſt declination of the Sun which is now 25. degrees 28. min. 73

FINIS.

THE MARRINERS GVIDE:

Set forth in forme of a Dialogue, *wherein the vse of the plaine Sea* Card is briefely and plainely deliuered, *to the commoditie of all such as haue* delight in Nauigation.

Written by Thomas Hood, *Doctor in Physicke.*

The contents of the booke are set forth in the page following.

Ignoti nulla cupido.

LONDON:

Printed by *Thomas Snodham*, for *Edmund Weauer*,

1611.

The contents of this Booke.

Card the mariners guide

1 WHat things are specially to be noted in the Sea Card.

2 Two places being assigned to find how they beare one from another diuers waies.

3 From a point giuen in the Card to draw a line Parallel to any point of the compasse.

4 To find the Latitude of any place assigned in the Card.

5 To find how many minutes are contained in any part of a degree of Latitude described in the Card.

6 To finde the distance of any 2. places assigned in the Card.

7 The comparing of the English and Spanish leagues together, and the manner how to make the scale of leagues.

8 The Rhombe being giuen, and the Latitude to finde how farre you haue gone.

9 The way which the ship hath gone being giuen, and the Rhombe, to find the Latitude.

10 The way of the ship being giuen, and the Latitude to find the Rhombe.

11 To find the distance from the shoare.

12 To find how you haue raised or let fall the Pole.

13 In raising or letting the Pole to fall a degree to find how many leagues we haue runne.

14 To find the distance from the Meridian in rayſing or letting the Pole fall a degree.

15 How to keepe your trauerse vpon the Card.

16 How to keepe your trauerse vpon the Card of a small pricke as well as if it were of great pricke.

17 How to keepe your trauerse vpon the Card though the land lye very nigh the edge thereof.

To

To the induſtrious Saylors, health, and proſperitie.



Entlemen Saylors, and whatſoeuer elſe you are that trauaile by Sea, for your ſake I haue vndertaken this paines. I haue had to do a long time with diuers of your profeſſion both for the making of Sea Cards, and alſo for inſtructing them in Mathematical matters belonging to Nauigation. Amongſt whom I haue found many willing to learne, and by that meanes had an inſight into their wants. I found certaine defects in pricking and vſing of the Card, and therefore I haue written this little Dialogue, concerning the vſe of the ſame, which if you pleaſe to peruſe at your leaſure, I hope you ſhall find that therein, which ſhall be profitable to the ignorant, and not vnpleaſant to the skilfull: howſoeuer it ſhall be either pleaſant, or profitable, if you vouchſafe to take it in good part, it will be meanes to moone mee, to a farther labour for your commoditie.

Yours THOMAS HOOD.

The Plain Chart Groweus: I. Dunk

The Plain Sea Card Groweus

The vſe of the common Sea Card: written in *forme of a Dialogue.*

M. NOw in good ſooth Philomathes welcome, you are the laſt man whom I thought of, and I wiſhed for, to the intent that I might haue a word or two with you, concerning the commodity which your Mathematicall ſtudies haue afforded you, in matters of Nauigation.

P. Sir, I thanke you moſt hartely for your good remembrance, and I muſt néeds confeſſe, that there was no man, with whom I more deſired to ſpeake then with you: partly that I might thankefully acknowledge the profit reaped by your inſtruction, and partly that I might requeſt of you a farther matter, which being obtained, I ſhall thinke it no ſmall increaſe of that heape of benefits, which many times I haue receiued at your hands.

M. Speake on Philomathes what matter it be which you deſire, you may command me in any reaſonable requeſt.

P. Being at ſea we were driuen to and fro, as winde and weather ſerued vs, hauing ſometimes the light of the ſunne, ſometimes of the ſtars, ſometimes being depriued of them both for a long ſeaſon: yet notwithſtanding the maſter of our ſhip and his mate, with diuers other of the company, had certaine plats, as they tearmed them (ſuch as you commonly make, though I neuer greatly had regard to their vſe) wherein they could kéepe a reckoning of the way, which they had made, and ſet down a pricke repreſenting the place wherein they were, and performe many other prety concluſions. We thought it was moſt pleaſant to ſée them doe it, though I were much gréeued with mine owne ignorance in that matter: yet hauing an hope by your meanes to attaine to the knowledge thereof, I made haſt after mine arriuall, as my buſineſſe would afford to come vnto you, that I might be inſtructed in the vſe of the foreſaid Card.

M. Oh

M. Oh Philomathes, that were a dangerous matter for me to vndertake, partly because herein I might seeme to do, as Phormio the Philosopher did, who though he had neuer seene any campe, dared notwithstanding to discourse of warlike affaires before Annibal, and partly because I should seeme to iustifie this kinde of projection of the plaine Card, which I cannot safely defend, because it is erronious.

P. What, is it faultie? I pray you by what reason doe you proue your saying: they haue beene vsed, and are yet retained by most excellent Nauigators of our time.

M. I know it well Philomathes, that they are retained by many excellent men, but yet with this daily wish, that the same might be amended, and that there might a better projection be made: but hereby you may perceiue the error of these plats, in that the Meridians being parallel, the degrées of Longitude and Latitude which are in them haue not in any respect that Symmetrie and proportion one to another, which the Globe requireth: for in this plaine description of the Card the degrées of Longitude, and Latitude in each seuerall parallel are of one quantitie, & the Meridians méeting with the parallels, make perfect squares, which is contrary to the nature of the Globe, wherein the Meridians tending to one Pole, either North, or Southward, the degrées of Longitude in each parallel betweene the equator and the pole, waxe shorter and shorter, according as the parallels come nérer and nérer to the pole, and the Meridian méeting with the parallels make vnperfect squares, which the Geometricians call Trapezia. The plaine Card is erronious.

P. Indéede I remember that the Saylors many times haue acknowledged some such kinde of fault, and by supposition imagining that two ships comming from the equator, and being two hundred leagues asunder, should bend their course Northward, vnder the Meridian, vntill they came to the 60. parallel, by the plaine Card they cannot be found to be lesse then 200. leagues distant one from another, which is impossible, considering that the 60. parallel, is but halfe

the content of the equator, and therefore those two shippes should be but halfe that distance one from another, which they were vnder the equator, namely, 100. leagues. Moreouer I haue heard them acknowledge this, that there are three things which they can very hardly bring together vpon their Plat, without committing an error in the one of them, that is to say, the point of the compasse, vpon which they saile, the distance, and the Latitude: besides the land is greatly disfigured from his naturall forme, so that it is nothing like vnto that which we see described vpon the Globe: but notwithstanding all these things alledged either by you or me, let my request preuaile, which is, that you will vouchsafe to teach me how to vse the plaine Card.

M. If you will néeds haue me fulfill your desire Philomathes, I will doe what I can to satisfie you, craning notwithstanding, that this my déed be not preiudiciall to any other mans, whose experience in Hydrographicall matters is more then mine: when his discourse commeth forth, let it be accepted as it shall deserue, in the meane season, let this serue the turne.

P. Goe to then, first, let vs consider what things are described in the Card, secondly, what vse they haue.

What things are especially to be regarded in the sea card.

M. The things described in the Card, and especially to be noted are these. First, the Hydrographicall description of the sea coast. Secondly, the lines drawne ouer the face of the whole card, concurring one with another iointly together in sundry places of the Card in one point, which I terme the center of the Flie, for instruction sake, following the common phrase of speech. These lines are commonly called the points of the Compasse, but in teaching because I would gladly auoid the tediousnesse of that name, therefore hereafter I will call them Rhombes, following the Spanish appellation, who hath so intituled them in that (vpon the plaine Card especially) they represent after a sort the Geometricall figure, which is called a Rhombe. The names of these Rhombes are particularly expressed by certaine letters, both in the top,

toppe, and the bottome of the Card, the which letters haue this ſignification.

N.	Signifieth.	North.
N.B.E.		North and by Eaſt.
N.N.E.		North north Eaſt.
N.E.B.N.		North Eaſt and by north.
N.E.		North Eaſt.
N.E.B.E.		North eaſt and by Eaſt.
E.N.E.		Eaſt north eaſt.
E.B.N.		Eaſt and by north.
E.		Eaſt.
E.B.S.		Eaſt and by South.
E.S.E.		Eaſt South Eaſt.
S.E.B.E.		South eaſt and by Eaſt.
S.E.		South Eaſt.
S.E.B.S.		South Eaſt and by South.
S.S.E.		South ſouth Eaſt.
S.B.E.		South and by Eaſt.
S.		South.
S.B.W.		South and by weſt.
S.S.W.		South ſouth weſt.
S.W.B.S.		South weſt and by ſouth.
S.W.		South weſt.
S.W.B.W.		South weſt and by weſt.
W.S.W.		Weſt ſouth weſt.
W.B.S.		Weſt and by ſouth.
W.		Weſt.
W.B.N.		Weſt and by North.
W.N.W.		Weſt north weſt.
N.W.B.W.		North weſt and by weſt.
N.W.		North weſt.
N.W.B.N.		North weſt and by north.
N.N.W.		North north weſt.
N.B.W.		North and by weſt.

And here I muſt tell you this Philomathes, that for ſo

much as the maine vse of the Card dependeth vpon these lines, therefore you must endeuour your selfe tenth and nalle, to be readie not only in the names, that you may say your compasse both forward and backeward, but also in the lines, that seeing of any line you may be readie to name it, and the line being named, you must be ready presently to finde it vpon the Card.

The third thing to be noted, are the degrées of Latitude, contained betweene two small lines of the left hand of the Card, and hauing their numbers adioyning vnto them seuerally. The fourth and last thing is the scale of leagues both English e Spanish, set on the right hand of the Card. These are the chiefest things to be obserued: as for the Cyphers set at the vpper and neather end of the Card round about the Flies, they shall be expressed hereafter in their places, because they are not essentiall matters touching the substance of the Card, but voluntarily set downe for remembrance sake.

P. Well then I pray you let me vnderstand the vse of the forenamed things.

M. The end of the Hydrographicall description of the coast is to lay forth vnto vs not only the Baies, Capes, Angles, Ilands, Mountaines, Ports, Points, and Riuers, but also the dangers of the Sea, so farre forth as they may conueniently be deliuered to the eie: in the which you are to note, that b. signifieth a Bay, c. a cape: a an angle, i an Iland: ys Ilands: in a mountaine, po. a port: pa. a point, r. a riuer, t. a rocke, and a rocke with other great danger, if it haue prickes: the sands are expressed by small prickes.

P. There is no difficultie in vnderstanding of this: what say you of the lines which you call the Rhombes?

M. They haue this vse to direct or set our course from place to place, so that vpon them dependeth the answere vnto this proposition: Two places being assigned to finde out the Rhombe, that is to say, the point of the compasse vpon which they lye, and how wee are to direct our course from the one vnto

1. Prope.

vnto the other. The which proposition is to be performed 2. seuerall wayes, generally or particularly. The generall may be that, which teacheth vs to find out the Rhombe howsoeuer the places beare one from another, whether they lie iust vpon a Rhombe as precisely North, North East or South south West, or North and by East &c. or whether they bend somewhat more towards the East, West, north, or south, as when they lie north west, ℞ halfe a point to the westward, or south east ℞ halfe a point or a quarter, or three quarters to the eastward, &c. The which way to find the Rhombe generally is in this manner. Hauing found out in your Plat the 2. places assigned, which I suppose to be M.N. lay a straight ruler vpon them (if you please you may draw a line with a fine blacke lead from the one place vnto the other, extending it at large ouer the Carde, both aboue and beneath the 2. places assigned, but it is needlesse, for the laying downe of the ruler is as much as the drawing of the line) marke where the said ruler, or line if it be drawn, cutteth any one Rhombe (which or whensoeuer it is) of North and South, as for example, the line M.N. cutteth the middlemost Rhombe of North and South, in the point S. Then take the semidiameter of the Circle. A.B.C.D. namely, the line A.E. and according to that Semidiameter vpon the point S. describe an arche or peece of a Circle the shortest that may be drawne betweene the Rhombe of North and South, and the line running betweene the two places in such manner as you see the arche, T.W. Take the distance of the saide Arche, T.W. and count it from the point B. or the point D. either to the right hand, or to the left, according as the situation of the line drawne betweene the two places assigned shall best aduise you, (that is to say, if your course lie Southward and to the East, then count the distance from D. toward C. if you runne Southward, and to the West, count the distance from D. towards A. But if you set Sayle to the Northward Easterly, then reckon the sayde distance from B.

The generall way to finde the Rhombe.

toward C. if your course be betweene the North and the West, let the distance be accounted from A. toward A.) the Rhombe which shal be next vnto the foot of your Compasse, is it vpon which the two places assigned doe lie, and according vnto the Rhombe must your course be directed, if the winde will giue you leaue. As in this example, counting the arcke T.W. from D. toward A. I find the foote of my Compasse to light precisely vpon the Rhombe of South South-west, and therefore I say, that the Rombe, vpon which M. and N. doe lie, and according to that point of the Compasse must my course be kept from M. to N.

P. But put case that the foote of my Compasse doth not light precisely vpon any one Rhombe, but betweene two of them, how shall I then say the places are situated and lie one from another?

M. In this case you must denominate the position or lying of the two places according to the Rhombe, which shall be found to be next vnto the foot of the compasses, adding these words, & a quarter, halfe, or three quarters of a point more to the South, North, East, or West, and you shall see occasion. This is the generall way to finde the Rhombe.

P. But I remember I saw the Sayors worke otherwise.

M. You say true, for in searching out the Rhombe, or point of the compas, they set the one point of the compasses on the place from whence they put, & aiming or gessing how the place vnto the which they goe may beare from it, they extend the foote of your compasses accordingly as the Rhombe requireth, at the which they guessed, directing the foot of their compasses vpon the said Rhombe from the place of their departure vntill they came vnto the place vnto the which they entend to goe: But trust me Philomathes there is no way more ready & certaine generally, then that which I haue set downe, for if it be followed precisely according to my prescription, you cannot misse the bredth of an haire in finding out any Rhombe between 2. places assigned, because it bringeth forth the iust angle of position according to the description of the card.

P. I

P. I hope practise will bring readinesse: What is the particular way to finde out the Rhombe?

M. The particular way is that which requireth a certaine position, or situation of the two places assigned, and it is two-fold, having a double worke, according as the two places are diuerslie situated from, or neere vnto the Peridian. For this you may easily perceiue by your Carde, and by common sense also, that sometimes the assigned place, to which you bend your course, may be very neare vnto the Peridian of the place, from whence you depart, sometimes the place to the which you goe, may be farre off from the Peridian from whence you set saile, and neere vnto the east or West point of the compasse: whereupon there ariseth a two-fold worke in this manner to be performed. If the places lye neare the Peridian one of an other, (namely, if they lye not more then Northeast, or Northwest, South East, or Southwest, one from another) lay your ruler vpon them both, and marke where it cutteth any two of the parallel Rhombes, which runne East and West. The particular way to finde the Rhombe.

P. Doth it not make any matter which two parallels they be, which the ruler cutteth, whether they be in the middest, at the bottome, or at the top of the Carde?

M. It is neither here nor there, which parallels you make choise of in the performing of this conclusion, but it is best to chuse those two parallels, which are nighest together, be they whereseuer (so that the ruler doth touch them both) for sauing of your labour in extending of your compasses, as for example: if that I were to goe from M. to N. I lay my ruler vpon them both, and find that it cutteth all the parallel Rhombes of East and West, from N. downewards in the points, a. b. c. d. and e. but I make choise onely of the two neathermost parallels, and with my compasses I take the distance betweene the two points d. and e. wherein the ruler cutteth the parallels.

P. When this distance is taken, what is then to be done, and how must I proceed to finde the Rhombe?

M. Your compasses being kept at their extent, make choise also of the centre of some one fit being in either of the two foresaid parallels, as for example, I make choise of the center E. which is in the vppermost of the two parallels: in that center E I set the one foote of the compasses, and turne the other foote downeward to the other parallel, setting it precisely in the same: The Rhombe, vpon which the foot of the compasses doth fall, is that whereon the two places assigned doe beare one from another, as for example, I finde the foote of the compasses to light iust vpon the Rhombe of South southwest, wherefore I conclude that to be the point of the compasse vpon which N. beareth from M and according to that (so neere as may be) must I shape my course.

P. Yet here ariseth one doubt, which is this: when I set the one foote of my compasses in the one parallel, & turne the other foote toward the other parallel, is it not materiall which way I turne the said other foote, either to the right, or to the left hand?

M. Yes, it is greatly to be regarded, this must be your generall rule, namely, that as your ruler lieth, so must your compasses be situated, that is to say, the right line supposed to be drawne from the one foote of the compasses vnto the other, must be parallel to the side of the ruler: so shall you be sure to finde out the Rhombe, because this is a principle, as it were, concerning the Rhombes described in the plat, that all lines either actuall, or by imagination equidistant therein one vnto another, haue one and the same denomination.

P. And as I gesse, I must obserue that also in that rule, which you taught me before, namely, that if the foote of my compasses being situated orderly, shall not precisely touch any of the Rhombes, then am I to entitle the position of the two places according to that Rhombe which shall be next vnto the foote of my compasses, adding these words, and a little more to the Southward, or Northward, &c. As the fall of the compasses shall best admit me.

M. You

M. You say well: thus much concerning the first particular way of searching out the Rhombe, when the two places assigned lie nere to one anothers Meridian. But if it shall so fall out, that the two places assigned in your Plat lye not nere vnto one anothers Meridian, but beare almost East and West one from another: then can you not vse the former way conuenently, because either the compasses will not reach the two Parallels of East and West, as they did before, or else their extent will be very great, and the intersection of the ruler and the parallels will be so oblique, that you cannot iustly discerne where to pitch the fot of your compasses. Wherefore in this case you shall worke thus. Lay your ruler vpon the two places assigned, and marke where it cutteth any two Rhombes of North and South (which hereafter for instruction sake I will call Meridians, because indeed they are so.) As for example, I lay the ruler vpon O. and P. and finde it to cut all the Meridians, from P. toward my left hand: but for the performance of this conclusion, I make choise only of those two which are next vnto P. toward the said hand, the which Meridians are cut by the ruler in the points, f. and g. Take the distance of the two points, and setting the one fote of your compasses in any center of any line, which is in either of the Meridians (as for example, set it in the center W.) turne the other fot of your compasses about vntill the other fote touch the other Meridian (prouided alwaies that the situation of your compasses be like vnto the situation of the ruler,) the Rhombe vpon which the said fot of the compasses doth either precisely light or come nearest vnto, is it, which giueth the denomination to the position of the two places assigned, whereby in this example I say that P. beareth from O. West and by South, and O. lyeth from P. East and by North. Thus much briefely for finding out the Rhombe, either generally or particularly.

P. It followeth therefore now to speake of the degrés of Latitude.

M. You say true Philomathes, for our method doth require, that

that we ſhuld ſo proceed, but for ſo much as mine experience in pricking of the Card is more then yours, I think it not amiſſe to teach you a concluſion (which is the converſe of that which went before) becauſe it is of great vſe: you haue learned how to find out the Rhombe that thereby you may direct your courſe from place to place, now learne this alſo, From a point aſsigned in the Card whereſoeuer, to draw a line Parallel to any Rhombe aſsigned. But before I proceed I muſt aduiſe you of this, that the word Rhombe in this propoſition muſt be largely taken, as it was before, not only for any line direction vſually expreſſed vpon the Card, but alſo for any line by imagination concealed to be drawn betweene them, as that which is drawn ſouthweſt and halfe, or a quarter, or three quarters of a point to the Weſtward, and ſuch like, whereupon we ſay that this concluſion may be wrought alſo generally or particularly. For this you know that ſometimes we may name a Rhombe preciſely and ſimply, without any addition, as when I ſay that from the point O. I would haue a Rhombe drawn weſt ¢ by South directly: ſometimes we name a Rhombe with this addition, a quarter, halfe, or three quarters of a point more toward ſuch or ſuch a coaſt: as when I ſay that from the point I. I would haue a Rhombe drawn Southeaſt and by South, ¢ halfe a point more vnto the Eaſtward: Howſoeuer the queſtion is propounded, you ſhall generally abſolue it thus. From the point aſsigned (as for example, from I.) draw an infinit right line (that is to ſay, a line long enough to ſerue your torne) parallel to the next Meridian line (if the point aſsigned be not in the Meridian, for then this labour is ſaued.) Afterward with your compas take the length of the ſemidiameter ED. which is at the neather end of the Card toward the right hand, according to that ſemidiameter vpon the point giuen, namely vpon I. deſcribe an arcke or peece of a circle K. L. P. But where, or on which ſide of the line ſhal I deſcribe the ſaid arcke, ſhal I deſcribe it aboue, or beneath the point aſsigned, againe ſhal I deſcribe it on the right or on the left hand?

2. Propoſition.

M. You must describe the forsaid arcke according as your course requireth, that is to say, if your course lie to the southward, Easterly, or full East, describe the arck beneath the center or assigned point toward the right hand; if your course lye Southward, Westerly, or full West, describe it beneath the center or assigned point toward the left hand. If your course lie Northward, Easterly, or full East, describe the forsaid arck above the assigned point toward the right; but if it be Northward, Westerly, or full West, describe it toward the left hand: as in the example propounded, because from the point I. it is required that I should draw a line Southeast and by South, and halfe a point more to the Eastward, therefore the forsaid arcke KL. is described beneath the center or assigned point toward the right hand.

P. Hitherto I understand you: but let us proceed, when as upon the center or assigned point I have described an arcke according as my course directeth me, what must I then doe?

M. If your course lye Northward set the one foote of your compasses in the point B. which is on your right hand toward the bottome of the Card; but if your course lie southward, set it in the point D. and extend the other foot unto so much of the circumference, as is contained between B. or D. and the Rhombe assigned, as in the example propounded, I extend my compasses from D. to the Rhombe of Southeast and by South, and halfe a point more unto the Eastward, that is to say, I take the distance betweene D. and X. and then setting the one foot of my compasses thus extended in the beginning of the arcke, which I draw before, namely in the point K. with the other foot I make a marke in the same arcke in the point L. The right line drawn from I. (which is the point given) unto L. is the line desired, Parallel to the Rhombe of Southeast and by South, and halfe a point more unto the Eastward, for it maketh the same angle with the Meridian I K. which the line EX. maketh with the Meridian ED.

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This is the generall and most certaine way of drawing the Rhombe from a point given. But if it so fall out that the Rhombe, which is to be drawne from the point assigned, be simply named without addition of halfe a point more or lesse toward such, or such a coast, then you shall describe the said Rhombe thus. Among all the lines described over the face of the Card, seeke out (as neare unto the assigned point as may be) such a line as beareth the same denomination with the desired Rhombe: as for example, if from the point Q. you were enioyned to draw a Rhombe Southwest and by west, seek out a line that may beare that denomination, the which as it falleth out in this Card is that line that commeth from the Westermost part of England to the Iland of Faiall, among the Acores, namely the line y. Z.) Then setting the one foote of your compasses in Z. (that is, in the assigned point) put forth, or pull in the other foote so long, untill you may but touch the line y. Z. Afterwards set the one foote of the compasses in some other place of the line y. Z. either to the North or Southward as the desired Rhombe shall best advise you, as for example, in the point Z. and with the other foote make an arcke of a circle, on that same side of the line, upon which the assigned point is, namely th arcke R. the right line drawn from Q. the point assigned to the top of the said arcke is parallel to the Rhombe desired. Thus much concerning the finding out of the Rhombe, and the manner how to draw a line parallel unto any of them from a point assigned. Let us now proceed Philomathes to the use of the degrees which consisteth in this especially, any place being assigned in the Card to find the Latitude thereof.

P. By the Latitude you meane the distance of any place from the Equinoctiall either to the North or Southward, according as is commonly taken in Geographicall matters.

M. I doe so understand it, and here you must note also, that for so much as the Latitude of any place, and the height of the Pole at the same place are all one in number, though they be counted in severall manners, e from divers places,

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(for the Latitude as you know is counted from the equator toward the Zenith, or verticall point in the heauen right imminent ouer the place wherein we are, but the height, elevation, or Altitude of the North Pole is counted from the Horizon to the Pole it selfe) therefore they are vsually confounded, and we say that by the card we may find in what height any place is, or what Altitude or elevation the Pole hath aboue the Horizon of any place expressed in the Card: whereas in truth the degrées commonly expressed in the Card are not the degrées of the elevation of the Pole, but the degrées of Latitude. The which Latitude of any place assigned is found out thus.

Set the one foote of your Compasses in the place assigned, (as for example in the point O) and with the other foote take the shortest distance from thence to the next Parallel of East and West, either aboue or beneath it, so that your compasses being stretched forth, you may but touch the parallel. Then running with your eie along that Parallel toward the Scale of Latitude, marke where the Parallel cutteth the said scale, there set the one foote of your Compasses, and turne the other either vpward or downeward in the same Scale, as the place assigned shall best aduise you, the degrée vpon which the foote of the Compasses lighteth, expresseth the Latitude of the place, and consequently what height you are in.

As in this example you shall finde the point O. to be the 40. degrée of Latitude And here you are to note that if the place assigned be in any Parallel of East and West, then is your labour saued, for the Parallel it selfe directeth you to the Latitude.

P. I perceiue your meaning well: and mee thinketh I could frame a short rule vnto my selfe thereby to finde the Latitude in this manner. If from the place assigned to the Scale of Latitude there be a right line drawne Parallel to the Rhombe of East & West, the degree of the scale vpon which the said Parallel lighteth, expresseth the Latitude sought for:

A briefe rule concerning the finding out the Latitude.

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as you may perceiue by the line O.G. which cutting the scale of Latitude in the 40. Degrée, expresseth the Latitude of O.

M. Your rule is good: And here you are to note, that when you search the Latitude of any small Iland in the Card you must take your measure from the middest therof.

P. In searching of the Latitude of many places, there is one thing that troubleth me, because I know not what to say certainely. When my compasses light precisely vpon the beginning or end of a Degrée, then can I tell the iust Latitude of the place, because the seuerall numbers adioyned expresse the same: But if the Compasses fall betweene the beginning and ending of a degrée, what shall I then say?

4. Proposition. How many minutes are contained in each part of a degree.

M. If the foote of your Compasses falleth iust in the middest of a degrée, there are 30. minutes to be added to the number of the whole degrées: if it falleth on the 4. part you must adde 15. minutes: if on the third part, you must adde 20. minutes.

P. I graunt that also, but considering that this Card, yea and very few others haue such subdiuisions into quarters or terces of a degrée, I pray you giue me some generall rule whereby I may know what minutes are answereable vnto any part of a degrée contained betweene the beginning of the said Degrée, any pricke made at all aduentures within it.

M. If you doe remember it, I deliuered vnto you such a conclusion in that Booke, which I wrote concerning the vse of both the Globes Terrestriall and Celestiall. The selfe same rule which I did there write touching the Degrées of a circle either of the Globe, quadrant, or astrolabe, may be here applied to a right line diuided into degrées. Therefore when as the foote of your Compasses lighteth betweene the beginning and ending of any degrée, and you are desirous to know what number of minutes that part of the degrée may containe which is betweene the beginning of it and the foote of your compasses, you shall satisfie your selfe in this manner. Take the portion of the degrée assigned, e beginning

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at the nethermoſt degrée of the card, count it from thence vntill you haue reckoned 60. times, noting well where you make an end: for the number of the whole degrées comprehended betwéene the degrée whereat you firſt began, & the point wherin you ended, expreſſe the number of minuts contained in the portion of the degrée propounded. Otherwiſe to auoid the tedioulnes of turning the compaſſes ouer ſo many times, you may do thus: count the ſaid portion of the degrée 5. times ouer, noting well where your compaſſes lighted at the firſt time, from thence extend the foote of your compaſſes vnto the degrée whereat you began, & from that degrée count the ſaid diſtance 12. times ouer, noting wel where your compaſſes lighteth at the 12. time, for (as I ſaid before) the number of the whole degrées comprized betwéene the degrée whereat you firſt began, & the point, wherein you ended, expreſſe the number of minuts contained in the portion of the degrée propounded. Now if it ſhall ſo fall out at any time, that the portion of the degrée betwéen the beginning of it, and the foot of your compaſſes ſhal be ſo litle, that your compaſſes cannot be brought cloſe enough together to take it (as many times it falleth out by reaſon of the ill workemanſhip of the compaſſes) then take the portion of the degrée remaining contained betwéene the foote of your compaſſes & the end of the ſaid degrée, count that portion as you did the other, noting how many degrées of the ſcale of Latitude are contained betwéene the place where you began, & the point wherein you ended, that number of degrées being ſubducted from 60. expreſſe how many minuts are contained in the foreſaid ſmall portion. Moreouer, if the number of the degrées in the ſcale of Latitude be ſo few, that you cannot account the portion of the degrée aſſigned 60. times, then count it but 30. times, and double the degrées contained betwéene the beginning & the end of your account, or elſe count the ſaid portion but 15 times, and quadruple the ſaid degrées. So ſhall you alſo find the minutes. As for example, if in counting the portion of the degrée aſſigned 15. times ouer, you find 11. degrées & a

quarter

quarter to be contained betweene the place whereat you beganne, and the place wherein you ended, multiplie those degrées and the quarter by 4. and you shall find 45. minutes be contained in the portion of the degrée assigned.

P. Now tell me this I pray you, were it not good that the degrées of Latitude were greater?

M. It were good indeede for him that is but a young Scholler in pricking of his Card, but otherwise to an expert and cunning man it is neither here nor there, though they were halfe so small againe: And I will teach you hereafter how you shall kéepe your trauerse vpon your Card though the degrées of Latitude be but small, as well as if they were two inches long.

The vse of the scale of leagues.

P. Let vs now proceed to the scale of leagues, what vse hath it?

M. The vse thereof is to finde out the distance betweene place and place: So that the conclusion to be performed thereby it is this: two places being assigned to find their distance. In working of this conclusion, this is to bee noted, whether the places given are of lesser distance, are farther off one from another, then the length of the scale amounteth vnto. If the two places be of lesser distance then the length of the scale (as the points I & H are) extend your compasses from the one vnto the other, and apply them afward to the scale of leagues (beginning at the left end thereof) and you shall finde the distance of the places assigned either according to the English or Spanish account. But if the distance of the places assigned surmounteth the length of the scale of leagues, then with your compasses take either the the length of the whole scale, or some certaine number of leagues, as 20. 40. 50. or 100. and lay your ruler vpon the 2. places assigned, or else with a fine blacke lead draw a line from the one vnto the other, afterwards beginning at either of them, count the number of leagues which you tooke out of your scale (kéeping your compasses close by the rulers side) as many times as you can betweene them: Still adding

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the number of the leagues as you go on. If at length the foote of your compasses lighteth iust vpon the other place assigned, then doth the totall somme of the leagues added together expresse the distance of the 2. places. But if in setting the foote of the compasses forward, you find that it falleth beyond the place propounded, then bearing in minde the totall somme of the leagues already reckoned, and pulling in the foote of the compasses vntill it touch the place assigned, and applying them vnto the scale of leagues, you must adde the leagues contained betweene their feete, vnto the sum found out before & noted in your minde, for the totall number expresseth the distance of the places assigned. As for example, desiring to find the distance betweene I and R (the which point R is neere the Iland of S. Mary,) I take out of the scale 50. leagues, and counting the said by the edge of my ruler 4. times, which make 200. leagues, and turning the foote of my compasses the fit time toward the place assigned, I find that it ouerreacheth the place: wherefore bearing in minde the former 200 leagues, I pulled in my compasses vntill the foote touched the place assigned, and applying them vnto the scale, I found 87. leagues to be contained betweene their feete, which being added vnto the other 200. declare the distance of the two places to be 287. leagues according to the English account.

P. In good time were those words mentioned, for looking vpon the scale of leagues, I found on the vpper part thereof these words, English leagues, and vnder it, Spanish leagues: what meanes these words?

M. They are there set to signifie the difference betweene vs and the Spaniards in counting of distances. We attribute vnto euery degree on earth (that is vnto the 360. part of the Compasse of the earth) 20. leagues, each league containing 3. miles, so that we make the whole Compasse of the earth to be 7200. leagues, or 21600. miles. The Spaniardes hauing their miles longer then ours, attribute vnto each degree but 17. leagues and a halfe, so that by their

account the circuite of the earth is 6300. leagues, and one of their miles is vnto one of ours sesquiseptima, that is as 8 is to 7. and seuentie of their leagues make eightie of ours. Whereupon you shall note this, that many times two places said to be of a diuers distance one from another, yet are the places set where they ought to be, and there is no error in the Card, but the difference ariseth vpon the account diuersely made betweene vs and the Spaniards. As for example, from Cape Finister vnto Porto Santo, according to the Spanish account are two hundred leagues, but according to our account it is more by twenty foure, wherefore in picking your card you must haue a diligent eye to your Scale, lest in mistaking the one kinde of leagues for the other, you misreckon your selfe and finde fault with your Card where there is none. Is there any thing else which you would craue concerning the Scale?

P. Yea, I haue a question or two to be asked. If there be no scale in a Card, what shift shall I vse to make one?

M. I told you euen now that euery degrée according to the English account is twentie leagues, therefore fiue degrées are one hundred leagues, and two degrées and a halfe are fiftie leagues, so that if you take fiue degrées of the scale of Latitude, and diuide them into ten parts, each portion shal be ten leagues, and each of them diuided into fiue parts, are two leagues. But if you diuide the fiue degrées into eight parts, then is each part twelue leagues and ½. The Spanish Scale is thus made, 80. English leagues as I said before, are but 70. Spanish, therefore if you take foure degrées of Latitude and diuide them into 7. pèces each portion is 10. Spanish leagues.

P. I perceiue that I may make my scale of leagues by the degrées of Latitude. I pray you therefore contrariwise tell me, when the Card hath no degrées of Latitude, but a scale of leagues, how shall I find out the length of the degrées of latitude where by the Card was made?

M. The quantitie of each degrée of Latitude is easily found

found out by the English leagues, because 100. English make iust 5. degrées: but if the leagues be Spanish, you must diligently note this, whether the greater diuisions of the Scale containe seuerally 10. leagues or 12. and ½. If they containe 10 Leagues a péce, seauen of them diuided in 4. parts make 4. degrées, but if the foresaid parts be each of them twelue Leagues and ½ then take seauen of them, which amount vnto 87. leagues and ½ and diuide them into 5. péces, which make 5. degrées of Latitude, euery one containing seauenténe leagues and ½.

P. The third thing which I stand in doubt of is this: when the Card hath neither Degrées of Latitude nor Scale how I shall make them both.

M. This cannot be done vnlesse that the distance betwéene some two places in the Card be certainely knowne, and then it may be gathered out of that which hath bin said before, especially if the two places assigned lye North and south one from another. As for example, if I know that the distance betwéene cape Vincent and the rocke is 40. English leagues, or two degrées of Latitude, I may out of that distance easely gather the quantitie of my scale of Leagues and degrées.

P. Let vs now procéde: Hitherto we haue spoken of the Rhombes, of the Scale of Latitude, and the Scale of leagues, as they were to be considered seuerally each one by it selfe, what is to be considered in them being ioyntly vsed and linked one with another?

M. There ariseth out of them being ioyned together, many conclusions: As first of all this. The Rhombe being giuen and the Latitude, with which you sail, to finde the distance or the way which the Shippe hath made from any place assigned. The performance of the which proposition may thus briefely be deliuered. If from the place assigned there be a right line drawne parallel to the Rhombe assigned, and from the degrée of Latitude there be another line drawne equidistant to the Rhombe East and West, 7. Propo.

cutting the forsaid line in some certaine place. The length of the right line contained betweene the point of the intersection where the cut is made, and the place of your departure being applyed to the Scale of leagues, expresseth the distance or the way which the Ship hath made.

As for example. I suppose that from the point N. I went South and by East three quarters of a point more to the Eastward, untill I fell with the 40. degrée of Latitude. Therefore (by the second proposition of this booke) from N. I draw a line parallel to the Rhombe of South and by east, &c. and from the 40. degrée of latitude, I draw another line parallel to the Rhombe of East & West, the two lines drawne concurre & méete in the point O. the length of the line N. O. applyed to the scale, expresseth the distance to be 75. leagues.

6. Propo. An other conclusion is this: The distance or way, which the Ship hath made, being given, and the Rhombe to finde in what latitude you are. The proposition is thus performed. If in the right line drawne from the place assigned parallel to the Rhombe given, be limited according to the scale of leagues, the distance or way which the Ship hath made, the right line drawne from the end of the said distance parallel to the Rhombe of East and West shall cut off in the scale of Degrées the Latitude sought for. As for example from N. I went South & by East three quarters of a point, more to the Eastward seuenthe five leagues, I demaund with what Latitude I fell. From N. I draw a line parallel to the Rhombe of South and by East, &c. (by the second proposition) in the which line I account the distance, that is, seauenty five leagues from N. to O. then from O. I draw a right line Parallel to the line of East and West, which cutteth the scale of latitude in the fortie degrée, which is the degrée sought for.

7. Propo. The third conclusion is this. The distance being given, and the Latitude, to finde the Rhombe, your rule is this: If from the Latitude given forward the place assigned there be a right line drawne parallel to the Rhombe of East

East and West, and one the place assigned being the center there be a circumference described, having for his Semidiameter the distance given, and cutting the foresaid parallel at all aduentures in a point on that side of the Meridian, on which your course doth lie, the right line drawn from the place assigned to the said point where in the section was made, shall expresse the Rhombe desired. As in this example. Suppose that going from N. 75. leagues, I found my selfe to be in fortie degrées of latitude, I would know vpon what Rhombe my course was made.

From the 40. degrée of Latitude, I draw a line OG. Parallel to the Rhombe of East and West. Then with my compasses I take out of the scale 75. leagues, & setting the one foote of them in N. (that is in the place assigned from whence I departed) with the other foote on the right side of the Meridian, because my course lieth Easterly, I make a circumference, cutting the line OG. in the point O. I draw a right line from N. to O. which by the first proposition I finde to be the Rhombe of Southeast and three quarters of a point more into the Eastward, vpon which I made my course.

P. In making of the circumference mentioned in your rule, why do you bid me cut the Parallel on that side of the Meridian on which my course doth lye?

M. Because the Parallel line which is drawne from the scale of Latitude may be cut as well on the East as on the west side of the Meridian from whence you depart, and therefore in answering to the former proposition, there is a secret consideration to be had with your selfe which way your course doth lie, whether to the right or left hand of the Meridian, the which consideration being had, and the compasses being guided accordingly, we may easily find out the Rhombe.

P. These three conclusions me thinketh should be not onely pleasant, but also very commodious for the Saylor, being by either of them he may easily and readily find the

place wherein hée is, which as I remember they called pricking of the Card: for the point wherein the Rhombe assigned, and the Latitude, or the assigned Rhombe, and the distance, or the assigned Latitude and the distance do concurre, erpresseth the place wherein he is.

M. You say true Philomathes, and for so much as there are three things whereby the sea-faring man may help himselfe by meanes of his card, that is his latitude, his distance or way which his ship maketh, & the Rhombe, vpon which he shapeth his course, hereby he may assure himselfe two of them being giuen (namely the Rhombe, and the latitude, or the Rhombe and the distance, or the latitude & the distance) whether he hath erred in the other yea or no, and how much he hath erred. As for example: If in sayling from N. to O. South and by East three quarters of a point more into the Eastward, and finding my selfe to be in the 40. degrée of latitude, I shall affirme that I haue run 75. leagues, by the first of these three conclusions which is the fift proposition, I shall certifie my selfe whether I kept the reckoning of my way true, yea or no, for my compasses being extended to that number of leagues, and the one foote of them being set in N if the other foot reacheth iust vnto the point O. wherein the Rhombe and the latitude are supposed to concurre, I may assure my selfe that my distance was truly obserued. But if the foote of the compasses shall fall either short off, or beyond the point O. then haue I erred in obseruing the way of the Ship: and the distance betweene the foote of the compasses and the point O. being applied to the scale of leagues, erpresseth the quantitie of mine error. Secondly, if by the diligence of mine obseruation I can assure my selfe that I haue run south and by east, three quarters of a point more to the Eastward 75. leagues, and at length obseruing the Sun or Starre, shall auouch that I am in the 40. degrée of latitude: then pricking out my course vpon the Rhombe from N. to O. if that the right line drawn from the 40. degrée of latitude parallel to the Rhombe of East and West doth

doth not preciſely concurre in the point O. but falleth either aboue or beneath it, then haue I erred in taking my latitude, and the quantitie of mine error is bewraied by the ſhorteſt line drawne from the point O. to the ſaid parallel. In like manner if by my obſeruation preciſely made, I can warrant my ſelfe of my diſtance and of my latitude, and ſhall auouch that from the point N. I went South and by Eaſt three quarters of a point more to the Eaſtward. If from the point N I draw ſuch a Rhombe (by the ſecond propoſition) and it ſhall not concurre in the point O. wherein the Latitude and the diſtance doe concurre, then may I ſay that I haue erred in the Rhombe, and the quantitie of mine error is to be found by the arcke of the circumference contained betweene the point O. and the Rhombe drawne.

P I perceiue that theſe things doe follow, and are conueniently inferred of the three former concluſions, but may they be taken aſcertaine and true?

M. Oh Philomathes, you know I told you before, that the plaine card was not in all points correſpondent to the dimenſions of the Globe, and therefore there cannot a moſt exquiſite and a preciſe truth be warranted thereby, but for ſo much as the common marriner (the more is the pitie) hath no better help, I teach him and you how to make a benefit and a pleaſure vnto himſelfe of that, which he hath ſo farre forth as the thing it ſelfe will permit him. Let vs now proceede. This alſo may be performed vpon the card: Two places vpon the ſhore being knowne, and the point of the compaſſe vpon which they beare from you, to finde how far diſtant you are from the ſhore, in a direct courſe, or from either of the two places. 8. Propo.

P. But is it not materiall whether I be thwart of the one of the two places yea or no?

M. It maketh no matter: let them lie from you howſoeuer, ſo that you and the two places be not in a right line. Your rule is this. If from the two places aſſigned there be Rhombes drawn oppoſit to the two Rhombes vpon which

the two places doe beare: the distance betweene the concurse of those two Rhombes and the Heare, or the places assigned: will expresse how far off you are from either of them, or from the shoare it selfe.

P. What meane you by the two Rhombes which are to be drawne opposite vnto the Rhombe, vpon which the two places doe beare?

M. This is my meaning, that if the one place doth lye East and by North, you should draw a Rhombe from it west and by South, and if the other place lye East southeast you should draw a Rhombe from it west northwest. For alwaies the concourse of the opposite Rhombes will expresse the place wherein you are, which being once knowne, you may by the scale of leagues easily gather how farre you are distant from any place. Moreover vpon the carde this may be per-
9. Propo. formed: the Rhombe and the distance being giuen to finde how we haue raised & let fall the Pole. For if in the Rhombe assigned (as for example) in the line NO. we count the distance vnto the point O. from the point N. the Parallels drawne east and west from the points N and O. shall in the scale of Latitude comprehend betweene them the degrées which we haue shifted in the height of the Pole.

P. Now that you haue made mention of rayling the pole, I pray you tel me, may not this conclusion be wrought vpon the card, in rayling or letting the Pole fall a degrée
10. Propo. to finde how many leagues we runne vpon any Rhombe assigned?

M. Yes that you may Philomathes, and that so much the better in that the question is but of one degrée, for in many degrées the error would appeare, as may be gathered by that which hath bin said heretofore concerning the projection of this card. And forasmuch as each seuerall degrée of this card is somewhat too little whereby to worke this conclusion conueniently, therefore suppose that 5. degrées of your card were but as one, then must each degrée be 4: leagues, and halfe a degrée must be 2 leagues. This being

supposed,

ſuppoſed, make choiſe of ſome one center of a flie within your Card, as for example, I choſe the center D. wherin the Rhombes do concur on the left hand of the card: aboue that center from the point F. which is diſtant from D. the length of 5. degrées counted notwithſtanding but as one, I draw a right line parallel to the Rhomb of Eaſt Weſt, e cutting the Rhombes proceeding from the point D. in the points a. b. c. d. e. f. g. Then making the line DF. your ſcale, (the which becauſe it is ſuppoſed to be a degrée) it muſt of neceſſitie be accounted for 20. leagues, if you meaſure therewith the lines Da. Db. Dc. Dd. De. Df. Dg. you ſhall eaſily finde how many leagues you run vpon any Rhombe, in raiſing, or letting the Pole fall a degrée.

P. Out of this me thinketh alſo that I may inferre another concluſion, which is this: The Pole being raiſed or let fall a degree, to finde how far I am diſtant from my Meridian running vpon any Rhombe aſsigned.

M. You ſay true: for if by the ſaid 5. degrées taken but for one, being in quantity 20. leagues, you meaſure the diſtance betweene the points F. and a. F. and B. F. and c. etc. you ſhall finde the diſtance betweene the Meridian and each ſeuerall Rhombe. Theſe concluſions Philomathes, aforeſaid, being noted diligently, it followeth now to teach you that, which is the ſumme of them al, wherein they muſt all ioyntly concurre together, the which concluſion is this: How to keepe your trauerſe vpon the card. The which propoſition though it be in words differing from the reſt, yet is there nothing in it, which hath not beene ſeuerally deliuered in the former propoſitions, ſo that it requireth onely a dexteritie in practiſing, and working that which you haue learned, as ſhall appeare in this example. Suppoſe that I were to goe from H. to Saint Maries Iland, the which two places as it may appeare by the firſt propoſition doe beare one from an other ſoutheaſt e by ſouth, two thirds of a point more vnto the weſtward, and by the fourth propoſition I find them to be 332. leagues aſunder, but making my courſe vpon the

foreſaid

foresaid Rhombe, I was no soner from the shore, but I was carried first with an easterly winde 100. leagues to the westward. Secondly, I was carried from thence to the Southeast a quarter of a point more to the eastward 90. Leagues. Thirdly, the winde comming about I was carried South southwest 72. Leagues. Fourthly, I was driuen by tempest south and by east three quarters of a point more vnto the eastward I know not how farre, but I found my selfe to be in the 40 degree of Latitude. Fiftlie, I was from thence enforced West and by South 60. leagues Sixtly, I was with a contrary winde put North northeast 40. Leagues. Seauenthly, I ranne 160. Leagues I know not vpon what Rhombe certainely, but it was to the westward of the Meridian, vntill I shifted my Pole foure degrees and a quarter. I demaund in what place I might be, and what Rhombe it was vpon which I ran last. 2. What Rhombe I should haue kept to the place wherein I find my selfe to be if I had not found the winde contrarie. 3. How many leagues I am from the place of my departure. 4. How I haue shifted the Pole. 5. How farre I am from my Meridian. 6. How manie Leagues I haue to R. 7. What Rhombe will set my course thither.

P. If it please you sir I will see how I can answere the question.

M. Doe so, it will be good for you alwaies to practise that which you know.

P. First, by the fourth proposition from H. westwarde I count 100 leagues to the point I. Secondly, by the 2. proposition I draw the Rhombe of South East a quarter of a point more to the Eastward, from the point I. to L. and in it from the said point I. count 90. Leagues to the point M. Thirdly, by the second proposition from the point M. I drawe the Rhombe of South south West, and count therein seauentie two leagues from M. to N. Fourthly, by the 6. proposition O I find my selfe to be in the point which is in the fortie degree of Latitude and 75. Leagues from

the

the point N. Fiftly, by the 2. and 4. propoſitions I finde my ſelfe to be in the point P. that is, weſt and by South 60. leagues from O. Sixtly, by the forenamed propoſitions, I find my ſelfe to be in Q. which is North Northeaſt fortie leagues from P. Laſt of all, by the ſeventh propoſition, I anſwere that I find my ſelfe to haue kept my courſe ſouthweſt and by Weſt, and to be at the point R. Secondly if I had not bin moleſted with contrary windes, I might haue run Southweſt and by South halfe a point more to the Weſtward. Thirdly, I am three hundred thirty 2. leagues from H. Fourthly I haue chifted the Pole 13. degrées ½. Fiftly, I am from the Meridian of H. according to this proiection of the Card two hundred 14. leagues. Sixtly, I haue vnto the Iland of Saint Maries, aboue 12. leagues, and I muſt ſet my courſe thither Weſterly.

M. You haue anſwered the queſtion Philomathes directly: here might we make an end of the vſe of the ſea Card, were it not that I remember you propounded vnto me a queſtion heretofore concerning the degrées of Latitude: whether it were not better for the Marriners vſe, if they were greater then they be vpon this Card: I muſt confeſſe, that generally all inſtruments Mathematicall, to be vſed either by land or ſea, are ſo much the more commendable by how much the more they excéed in quantity: but touching the plain ſeacard though it be but of a very ſmall pricke, yet may it be vſed as if it were 2.4. or 8. times ſo great againe as it is. For as for the Rhombes they ſerue our vſe in a ſmall Card as wel as in a greater, and that ſo much the better, by how much they come the nearer together, ſo that the compaſſes néed not ſo large an extention on the ſmall Cards, as they require vpon thoſe, which are of a larger pricke. As for the ſmall neſſe of the degrées of Latitude, they may be remedied by ſuppoſing 2.4. or 8 degrées to be but as one, and ſo likewiſe may the leagues be taken 20. for 10. or 5. and 100. may be ſuppoſed to be but 50. or 25, according as you alter the propoſition of the degrées of Latitude.

P. I pray you make this thing plaine vnto me, I doe partly perceiue your meaning by your former words, but I would haue the matter laid open more manifestly.

M. When as the degrées of Latitude in your Card, and the leagues of the scale doe séeme to be to little for your vse; First of all séek out in it by the first proposition, the Rhombe vpon which the place, whither you goe beareth, from the place of your departure, séeke out also the Latitude of the place from whence you depart. Then suppose so many degrées of Latitude in your Card (as you thinke good) to be but one, (for example sake, suppose 4. of them to be but one, so that each seuerall degrée by his supposition is but a quarter, and each halfe degrée is but halfe a quarter: and consequently in the scale of leagues 10. degrées are but 20. and 20 are but 5. and the small space betweene the pricks is but halfe a league,) according to this supposition you must pricke your Card and kéepe your trauerse.

P. That I know, but when I haue kept my trauerse according to that supposition, how shall I reduce the place, wherein I find my selfe to be by my trauerse, into my own Card, that my card being neuer so little I may say that this, or this is the place wherein I am. As for example, if I were to go from Cape S. Vincent to Porto Santo, my course lieth Southwest and by West. And this I perceiue that I should suppose euery 4. degrées of this card to be but as one, I must suppose Porto Santo to lie from Cape S. Vincent 4. times so farre as it doth. Now say that I ran from Cape S. Vincent West Southwest 60. leagues, then by the former supposition I. must néeds be in the point Z. which in the Card is is beyond Porto Santo a great deale to the Westward, whereas I should be betweene Cape S. Vincent and Porto Santo, therefore I pray you tell me how in my Card I may make a pricke respecting the true place wherein I am.

M. This thing Philomathes is most easily done if you marke the proportion of your supposition. You suppose 4. degrées to be but as one, therfore the point Z. is 4. times so far

from

from Cape S. Vicent as shoulde be, so that if you divide the length of the line betweene the Cape and the point Z. into foure parts, the fourth part is the true distance from the Cape. In like maner if you would know the Latitude, wherein you are according to your Card it selfe, divide those degrées of Latitude which are contained betweene the Latitude of Cape S. Vincent and the latitude of the point Z. into foure equall parts, for the fourth part giueth the Latitude wherein you are.

This thing Philomathes is worth the obserning, for by this meanes you shall be able to vse your Card of what quantitie soeuer it is.

P. I doe now vnderstand better then I did before, and I obserue this as a generall rule. that I must alwaies follow the proportion of my supposition in finding out either the true Latitude or the true distance: for as touching the Rhombe that kéepeth still his denomination. So that if I should suppose two degrées of my Card to be but as one, then must I take halfe the supposed distance for the true distance: and if I suppose eight degrées to be but one, I must take the eight part of the supposed distance to be the true distance, and in like manner must I doe in finding the true Latitude.

M. You say well Philomathes. And here you are to note that you may suppose the place of your departure to be in any place of your Card where you thinke most conuenient to kéepe your trauerse (or if you will you may kéepe your trauerse vpon some blacke shinne which hath nothing in it but the lines) imagining the degrées to be as great as you please, and afterwards you may apply it to your Card by the vertue of the first proposition, which teacheth you the Rhombe being giuen and the distance, to finde the true Latitude, and consequently the place wherein you are, the said Rhombe being drawn, and the distance accounted in your Card from that place, from the which you departed. Moreouer if it shall so fall out, that beyond the Ilands or

other

other coast of the land set downe in your Card, there be not scope enough for you to trauell, either East, West, North, or South, (as for example in this your Card, there is not space enough to trauel either from the Terceras westward, or from the Canaries southward) you may by the former rule suppose any place in your card to be the place wherein you are, and afterwards kéepe your traverse at your pleasure.

Thus much briefely Philomathes concerning the vse of this plaine Card, wherein, if I haue satisfied you to your contentment I shall be glad, but this I could wish, that you should not alwaies addict your selfe vnto this kind of plat, but labour and striue to be cunning in any other, that are extant, that comparing the one with the other, you may make choise at the length of the best, though in the meane season you vse this as an help in your trauell. And thus, &c.

P. Now stay a while sir I pray you, there is yet one thing to be spoken of, which are the cyphers set round about the two flies, whereof the one is at the bottome, the other at the top of the Card, I would faine know to what purpose they are.

M. You remember that in the tenth proposition, wée spake of the Leagues, which were vnne vpon euery point of the compasse in rayling, or laying the Pole a degrée, these Leagues are expressed in the vppermost halfes of that circle which incompasseth the great flie at the bottome of the Card, from A. to B. & from B. to C. and are adioyned to each Rhombe, or point of the compasse, whereof those, which are on the quarter AB. are the English, the other on the quarter BC. are the Spanish Leagues.

Moreouer in the eleuenth proposition, wée spake of the distance from the Meridian in rayling the Pole or letting it fall a degrée sayling vpon any Rhombe assigned. Those Leagues, both English and Spanish, are likewise expressed vpon the neither halfe of the circle, that they might be ready

for

for those which are desirous to know them vpon a saddame, without the vse of the Compasse. The other cyphers which are set about the Flie at the toppe of the Card, serue for the finding out of the height of the Pole by the North or Pole-starre, according as it is pointed with the guardes: So that by the placing of the foresaid figures you are to note this, that the former guards being in the East, the North-star is one degrée and an halfe vnder the Pole, and therefore you must adde so much (for so the letter A. doth signifie to the height of the star, that thereby you may find the true height of the Pole.

Item, the guardes in the West, the starre is one degrée and an halfe aboue the Pole, & therefore you must subduct so much (for so the letter S. doth signifie) from the height of the starre to find the height of the Pole. In like manner you are to adde or subduct the numbers set vpon the other points of the compasse vnto or from the height of the North starre according as the letters A. and S. do direct you. These things Philomathes, the Saylors by their long experience, haue noted to be anaileable for their vse, and therefore they haue thought it good to point them into their Cards, the which thing you may apply also to your commoditie as occasion serueth, hauing the meaning thereof laid open vnto you, hereafter I will be ready to farther you in any other Mathematicall conceit, to the vttermost of my power.

P. I know it well, and haue had much experience of your good will, and therefore I thanke you, and I acknowledge my selfe a debtor for the same. But before we part, I pray you let me haue your opinion in this: what thinke you of Mercators Card? and wherein differeth it from the plaine Card?

M. Philomathes, I iudge it to be an excellent worke in respect of the projection thereof, and might (by inlarging of it be made most fit and conuenient for the Saylors vse: it differeth from the common Card in this, that the degrées of Latitude are not equall, but wax greater and greater toward

toward the Pole, whereby there arieth a double commoditie, for by this meanes the land is not so distracted as it is vpon Plancius his Map, who followeth the proiection of the plaine Card, and it commeth very neere vnto the Symmetrie of the Globe, because the degrées of Latitude are so proiected, that each one of them may be the scale to measure iustly the circumference of that parallel which runneth through the end of the said degrée, so that you may truely measure the distance betweene East and West, and it is therefore the best Card, that ever I saw extant, whereon you may kéep an account of your Longitude. In the vse of it the degrées of the Equinoctiall are the common scale to measure any distance assigned, and your reckoning must be kept not vpon the Rhombe vpon which your course lyeth, but vpon that Rhombe, which is farre distant from the equator, or Parallel of East and west, as the Rhombe, vpon which you made your course was distant from the Meridian. Thus much Philomathes concerning that matter, I feare my speech séemeth darke vnto you, and my leasure will not now serue me to shew you the booke, which I haue written concerning the vse of Mercators card. Hereafter when more leasure shall serue I will be readie to let you haue the sight of it.

P. I thanke you, in the meane time I bid you farewell.

FINIS.